

# M a n u a l

## **QVT-102 Maintenance Guide**

July 1983



## PREFACE

The QVT-102 Maintenance Guide has been designed to enable maintenance personnel to quickly isolate a fault and take corrective action in a minimum amount of time. It is assumed that all who may use this guide have rudimentary knowledge of the QVT-102 video terminal.

The QVT-102 Maintenance Guide is divided into the following sections:

- **Troubleshooting** - for isolating a fault to a subassembly.
- **Subassembly Removal and Replacement** - for replacing the failed subassembly.
- **Alignment** - for performing any necessary video alignment after replacing a subassembly.
- **Parts** - for identification of parts and spares information.
- **Circuits and Diagrams** - reference.

## ASSOCIATED PUBLICATIONS

Refer to the QVT-102 Operator Manual, Reorder Number 35003, for general user information. For abbreviated user information, refer to the QVT-102 Quick Reference Card, Reorder Number 35008.

## TABLE OF CONTENTS

	Page
<b>SECTION 1. TROUBLESHOOTING.....</b>	<b>1-1</b>
Introduction.....	1-1
Troubleshooting Technique.....	1-1
Troubleshooting Flowcharts.....	1-1
Tools and Equipment Required.....	1-1
Fault Isolation Flowchart # 1.....	1-2
Fault Isolation Flowchart # 2.....	1-4
Fault Isolation Flowchart # 3.....	1-6
Fault Isolation Flowchart # 4.....	1-7
Fault Isolation Flowchart # 5.....	1-8
Error Codes Summary.....	1-9
 <b>SECTION 2. SUBASSEMBLY REMOVAL AND REPLACEMENT.....</b>	 <b>2-1</b>
Introduction.....	2-1
Safety Summary.....	2-1
Lower Monitor Area.....	2-1
Upper Monitor Area.....	2-1
Cover Sets.....	2-2
Keyboard - Top Cover.....	2-2
Keyboard - Bottom Cover (Keyboard PCB and Coiled.... Keyboard Cable)	2-2
Key Caps.....	2-5
Monitor - Back Cover.....	2-6
Monitor - Bottom Cover.....	2-8
Lower Monitor Area Subassemblies.....	2-10
Logic PCB.....	2-12
Switching Power Supply.....	2-13
Power On/Off Switch.....	2-14
Fuse Holder.....	2-14
Battery.....	2-16
Brightness Potentiometer.....	2-18
Main Wiring Harness.....	2-19
Upper Monitor Area Subassemblies.....	2-20
Video PCB.....	2-22
CRT.....	2-24
 <b>SECTION 3. ALIGNMENT.....</b>	 <b>3-1</b>
Introduction.....	3-1
Tools and Equipment Required.....	3-1
Alignment Conditions.....	3-4
Video Alignment Procedures.....	3-6
Horizontal Display Width (Line Width).....	3-7
Vertical Display Height.....	3-7
Display Centering (Raster Tilt).....	3-7
Horizontal Linearity (Uniform Character Width).....	3-8
Vertical Linearity (Uniform Character Height).....	3-8
Brightness.....	3-9
Focus.....	3-9

## TABLE OF CONTENTS (Cont)

	Page
<b>SECTION 4. PARTS.....</b>	<b>4-1</b>
Recommended Spare Parts.....	4-7
<b>SECTION 5. CIRCUITS AND DIAGRAMS.....</b>	<b>5-1</b>

## LIST OF ILLUSTRATIONS

Figure		Page
2-1	Keyboard Top Cover Removed.....	2-3
2-2	Keyboard PCB Removal and Replacement.....	2-4
2-3	Key Cap Removal and Replacement.....	2-5
2-4	Monitor Back Cover Removal and Replacement.....	2-7
2-5	Monitor Bottom Cover Removal and Replacement.....	2-9
2-6	Lower Monitor Area.....	2-11
2-7	Power ON/OFF Switch and Fuse Holder Removal and..... Replacement	2-15
2-8	Battery Removal and Replacement.....	2-17
2-9	Brightness Potentiometer Removal and Replacement.....	2-19
2-10	Upper Monitor Area.....	2-21
2-11	Discharging the CRT Anode.....	2-23
3-1a	QVT Alignment Tools Set.....	3-2
3-1b	QVT Alignment Tools Set.....	3-3
3-2	The "H" Test Pattern.....	3-5
3-3	Video Alignments.....	3-6
4-1	QVT-102 Exploded View Diagram.....	4-3
5-1	QVT-102 Functional Block Diagram.....	5-3
5-2	QVT-102 Interconnect Wiring Diagram.....	5-5
5-3	QVT-102 Keyboard Schematic.....	5-7
5-4	QVT-102 Video PCB Schematic.....	5-9
5-5	QVT-102 Logic PCB Schematic.....	5-11

## LIST OF TABLES

Table		Page
1-1	Error Codes Summary.....	1-9
4-1	Recommended Spare Parts.....	4-7

## SECTION 1

# TROUBLESHOOTING

## INTRODUCTION

This section provides a troubleshooting method for isolating most QVT-102 failures to an easily replaced subassembly, by systematically advancing through a series of troubleshooting flowcharts.

## TROUBLESHOOTING TECHNIQUE

Effective troubleshooting technique should always begin with a thorough visual inspection. Look for obvious things that may adversely effect the performance of the terminal, such as:

- Is the AC power source supplying adequate power,
- Is the brightness potentiometer properly adjusted,
- Are all connectors making good contact,
- Is there a compatibility problem between the terminal and the host?

## TROUBLESHOOTING FLOWCHARTS

When using the following troubleshooting flowcharts, always begin with Fault Isolation Flowchart # 1. Although each flowchart is more or less tailored to troubleshoot a general area, it should be noted that they have been purposefully arranged to quickly isolate a fault to a replaceable subassembly. It is not recommended that the flowcharts be used out of sequence.

Refer to the Circuits and Diagrams Section for more specific information as necessary.

## Tools and Equipment Required

- DB25 Loopback Connector,
- Phillips Screwdriver,
- Multimeter,
- High Voltage Probe,
- Interconnect Wiring Diagram and Schematics (refer to Section 5).

# Fault Isolation Chart # 1

Power On Unit.

Does Unit  
Display an Error Code. ---YES-----> Proceed to  
Fault Codes  
Summary (Page 2-9).

-NO

Perform Self-Test (ESC V).

Does Unit  
Perform Self-Test. ---NO-----> Proceed to Flowchart # 2.

-YES

Exit Self-Test,  
Enter Local Mode.  
Press Each Key on  
Keyboard.

Are Characters  
Displayed as Keys Are Pressed. ---NO-----> Proceed to Flowchart # 3.

-YES

Exit Local Mode, Enter On Line  
Mode & Full Duplex Mode.  
Install Loopback Connector to EIA Port.  
Press Each Key on Keyboard.

Are Characters  
Displayed as Keys Are Pressed. ---NO-----> Logic PCB Defective. Replace Logic PCB (refer  
to Section 2).

-YES

Connect Printer to AUX Port.  
Exit On Line Mode & Enter  
Local Mode. Print.

### Fault Isolation Flowchart # 1 (Cont)

Is Screen

```
Data Printed. ---NO-----> Logic PCB Defective.  Replace Logic PCB
|                               (refer to Section 2)
```

**-YES**

Unit Checks OK.

## Fault Isolation Flowchart # 2

From Flowchart # 1.

Are AC Line  
and Power Supply---NO-----> Replace Bad Fuse(s). Continue.  
Fuses Good.

-YES

Does Either Fuse Fail --NO---> Return. Begin Flowchart # 1.  
Again at Power On.

-YES

Verify Operation of  
ON/OFF Switch. Is ---NO-----> Return. Begin Flowchart # 1.  
Switch Defective.

-YES

Replace Switch (refer to Section 2). Continue.

Does Either Fuse Fail --NO---> Return. Begin Flowchart # 1.  
Again at Power On.

-YES

Replace Fuse(s). Disconnect P12, P13 and P14 to Isolate Power Supply. Power  
On Unit and Verify Power Supply Voltages: (All voltages are dc).

P12: Pin 1 +5 V  
Pin 2 GND H  
Pin 3 +12 V  
Pin 4 NC

P13: Pin 1 +5 V  
Pin 2 GND V  
Pin 3 +12 V  
Pin 4 NC

P14: Pin 1 +5 V  
Pin 2 GND  
Pin 3 +12 V  
Pin 4 -12 V

Are All Voltages ---NO-----> Power Supply is Defective.  
Present. Replace Power Supply (refer to Section 2).

-YES

Power Supply Checks OK. Power Off Unit and Reconnect Power Supply Connectors  
P12, P13 and P14. Disconnect P6 and the Keyboard Telephone Jack from the  
Logic PCB. Power On the Unit.



**Fault Isolation Flowchart # 2 (Cont)**

Does Either Fuse Fail --NO---> Logic PCB Checks OK. Keyboard or Video PCB  
Again at Power On. is Defective. Continue.

-YES

Replace Fuse(s). Connect Keyboard Telephone Jack to the Logic PCB.  
Power On Unit.

Does Either Fuse Fail --NO---> Keyboard Checks OK. Video PCB is Shorted.  
Again at Power On. Replace Video PCB (refer to Section 2).  
Return to Flowchart # 1.

-YES

Keyboard or Coiled Keyboard Cable is Defective.  
Return to Flowchart # 1.

## Fault Isolation Flowchart # 3

From Flowchart # 1.

Is +12 Vdc and GND Present  
at P11 on Keyboard PCB. ----NO-----> Coiled Keyboard Cable is Defective.  
(Pin 1, GND/Pin 2, +12 Vdc) Replace Coiled Keyboard Cable (refer  
to Section 2).

-YES

Is 10 Vdc + 1 V Present at ---NO----> Logic PCB is Defective. Replace Logic  
P10, Pin 1 on Logic PCB. PCB (refer to Section 2).

-YES

Depress Each Key on Keyboard For a Minimum  
of 2 Seconds Each and Observe an AC RMS  
Voltage at P10, Pin 1 on Logic PCB.

Does This Voltage Increase  
Approx. 200 mVac RMS While ---NO-----> Keyboard is Defective. Replace  
Each Key is Pressed Keyboard Assembly (Refer to  
Section 2).

-YES

Is The Correct  
Character -----NO-----> Proceed to Flowchart # 4.  
Displayed.

-YES

Unit Checks OK. Proceed to System Test.

## Fault Isolation Flowchart # 4

From Flowchart # 3.

Check the Following Voltages on the Logic PCB:

P5-1: Pin 1    +5 Vdc  
          Pin 2    +5 Vdc

P5-2: Pin 1    -12 Vdc  
          Pin 2    GND  
          Pin 3    +5 Vdc  
          Pin 4    +12 Vdc

Are All Voltages Present. --NO---> Defective Main Wiring Harness. Replace  
    Main Wiring Harness (refer to Section 2).

-YES

Verify Proper Operation of  
 the Brightness Potentiometer.  
 Rotate Pot Full CCW, Then Full  
 CW. Observe a 300 mVdc Voltage  
 Change Between Pins 1 and 2 of P7.

Does Voltage Change ---NO----> Brightness Potentiometer is Defective. Replace  
 Approx. 300mVdc.                    Brightness Potentiometer (refer to Section 2).

-YES

Blank Screen (Shift-Home/Clear).  
 At P6, Pin 5 Note an AC RMS Voltage.  
 Display Self-Test (ESC V).  
 At P6, Pin 5 Note an AC RMS Voltage.

Did Voltage Increase  
 Approx. 400 mVac RMS When ---NO----> Logic PCB is Defective. Replace Logic  
 Self-Test Was Displayed.                    PCB (refer to Section 2).

-YES

Proceed to Flowchart # 5.

## Fault Isolation Flowchart # 5

From Flowchart # 4:

Display "H" Test Pattern (Ctrl/Shift/Setup-Zero).

Check Voltages on Video PCB, P1:

Pin 1	+12 Vdc
2	GND
3	+12 Vdc
4	GND

Are Voltages Present. ---NO---> Main Wiring Harness Defective. Replace Main  
Main Wiring Harness (refer to Section 2).

-YES

With Brightness Potentiometer  
Full CW, Check P2, Pin 5 for  
Approx. 400 mVac RMS.

Is Approx. 400 mVac RMS Present. ---NO-----> Main Wiring Harness Defective. Replace  
Main Wiring Harness (refer to Section 2).

-YES

With a HIGH VOLTAGE Probe,  
Check the CRT Anode Cap  
for Approx. 13 kVdc.

**WARNING: HIGH VOLTAGE**

Is Approx. 13 kVdc Present --NO----> Video PCB Defective. Replace Video PCB  
at CRT Anode Cap. (refer to Section 2).

-YES

Check the Following Voltages on the Video PCB (Tolerance  $\pm$  25%):

P3, Pin 2	0.3 Vac RMS	K2	550 Vdc
P3, Pin 1	1.3 Vac RMS	K3	45 Vdc
P4, Pin 2	10 Vac RMS	K4	175 Vdc
P4, Pin 1	25 Vac RMS	K5	12 Vdc
K1	-28 Vdc	K6	0.1 Vac RMS

Are All Voltages Present. ---NO-----> Video PCB Defective. Replace Video PCB (refer  
to Section 2).

-YES

CRT Defective. Replace CRT (refer to Section 2).

**ERROR CODES SUMMARY**

As part of the terminal's power on sequence, it performs an internal self-test, and signals that it has successfully completed this test by sounding the audible alarm. However, if a non-fatal error is detected, an error code will be displayed on the screen. For example, if the letter "D" is displayed, this signifies that a fault has been isolated to the Logic PCB (i.e. IC U19). The following table lists all possible error codes.

Table 1-1. Error Codes Summary

ERROR CODE	CORRECTIVE ACTION
A	Replace U8, or the Logic PCB.
B	Replace U6, U7, or the Logic PCB.
C	Replace U6, U7, U8, or the Logic PCB.
D	Replace U19, or the Logic PCB.
E	Replace U8 and U19, or the Logic PCB.
F	Replace U6, U7 and U19, or the Logic PCB.
G	Replace U6, U7, U8 and U19, or the Logic PCB.
H	Replace the Keyboard.
I	Replace U8, or the Logic PCB, and the Keyboard.
J	Replace U6 and U7, or the Logic PCB, and the Keyboard.
K	Replace U6, U7 and U8, or the Logic PCB, and the Keyboard.
L	Replace U19, or the Logic PCB and the Keyboard.
M	Replace U8 and U19, or the Logic PCB and the Keyboard.
N	Replace U6, U7 and U19, or the Logic PCB and the Keyboard.
O	Replace U6, U7, U8 and U19, or the Logic PCB and the Keyboard.

Note: U6, U7, U8 and U19 are located on the Logic PCB.

## SUBASSEMBLY REMOVAL AND REPLACEMENT

### INTRODUCTION

This section describes how to remove and replace the major subassemblies of the QVT-102. Before beginning, place the Power On/Off switch in the OFF position and disconnect the power cord from the power source. Thoroughly read each procedure before attempting any subassembly removal and replacement. A medium size Phillips head screwdriver, a small adjustable wrench, and soldering equipment are the only tools required.

### SAFETY SUMMARY

In addition to the normal safety precautions that should always be practiced during any maintenance procedure on electronic equipment, personnel should also be aware of the following safety hazards.

#### Lower Monitor Area

The lower monitor area contains the logic PCB and the power supply.

#### CAUTION

Hazardous voltages are exposed in the general area of the power supply. Before performing any service in the lower monitor area, power OFF the terminal and disconnect the power cord.

#### Upper Monitor Area

The upper monitor area contains the CRT and the video PCB.

#### CAUTION

Take special care when working in the general area of the CRT. Do not scratch or strike the CRT or subject it to unusual pressure. The CRT contains a high vacuum and breakage of the tube may result in injury from flying glass. As a further precaution wear suitable clothing and eye protection.

A hazardous residual voltage may be present on the CRT at the flyback transformer anode cap. Always discharge the CRT anode to ground before performing any maintenance in the upper monitor area (refer to Step 2 of the Video PCB Removal and Replacement procedure).

### COVER SETS

The paragraphs below describe the removal and replacement of the cover sets for the keyboard and monitor. This procedure prefaces the removal and replacement of the other QVT-102 subassemblies.

#### **Keyboard - Top Cover**

The top cover of the keyboard is secured from the underside of the keyboard assembly by six screws.

##### REMOVAL

1. Disconnect the keyboard cable from the monitor.
2. Place the keyboard upside down on a level surface and remove the six screws. Lift the bottom cover with keyboard PCB away from the top cover.

##### REPLACEMENT

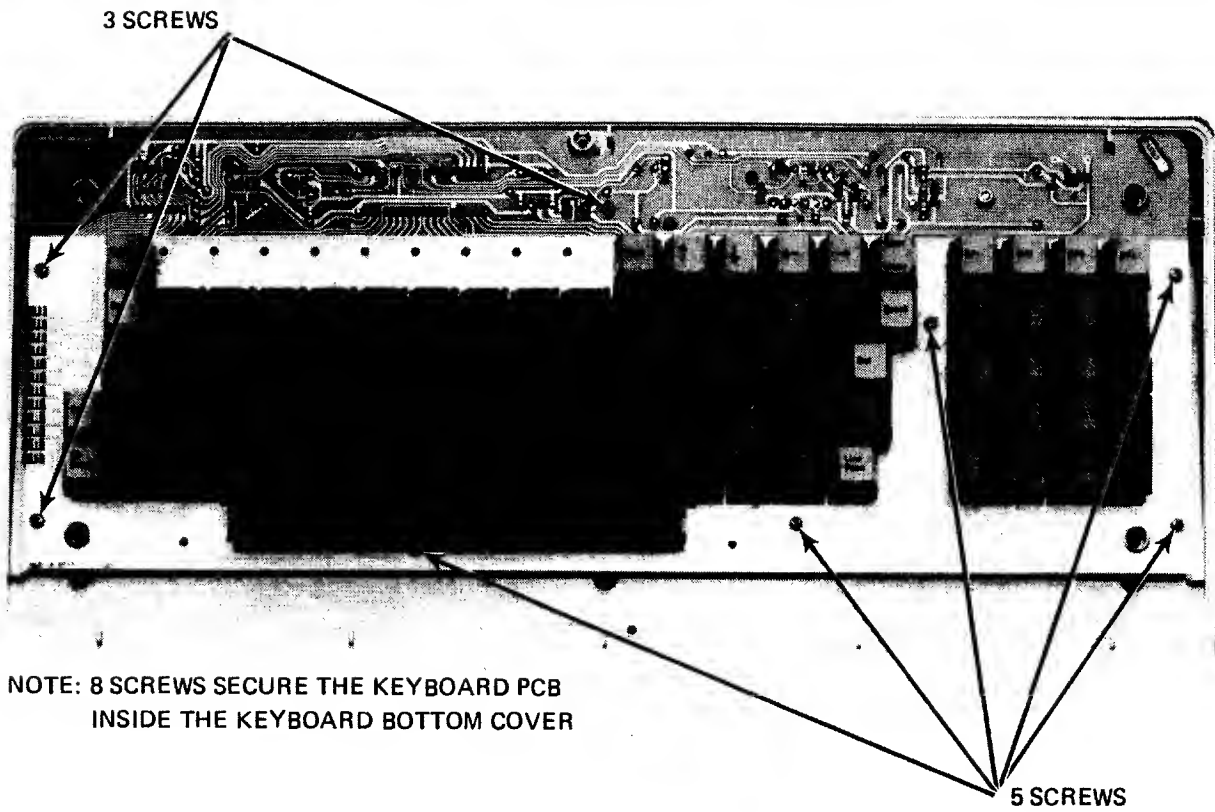
To replace the top cover, simply reverse the above procedure.

#### **Keyboard - Bottom Cover (Keyboard PCB and Coiled Keyboard Cable)**

To remove and replace the bottom keyboard cover, it is also necessary to remove and replace the keyboard PCB and the keyboard cable.

##### REMOVAL

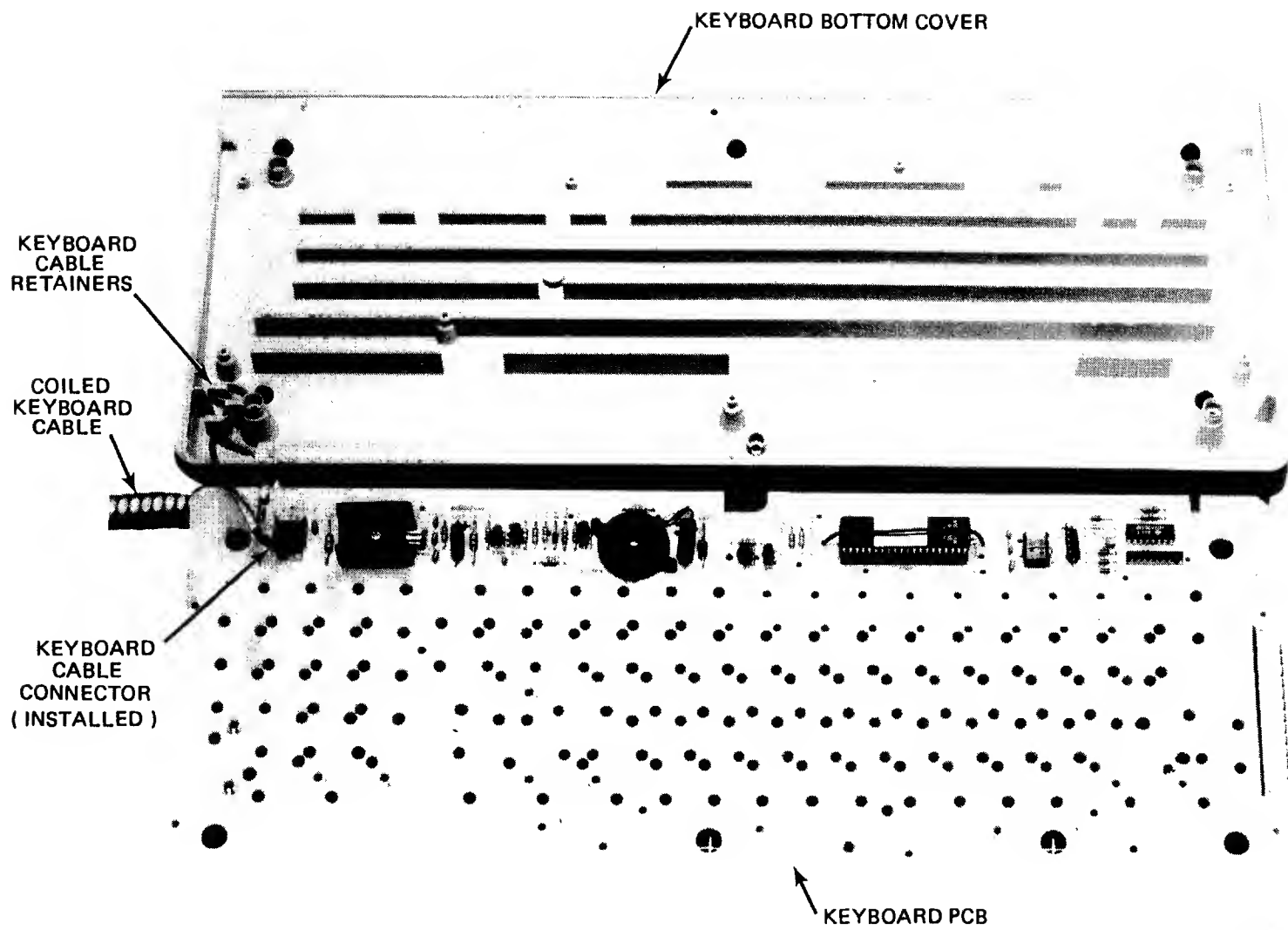
1. Remove the top cover from the keyboard assembly. Refer to the Keyboard Top Cover Removal and Replacement procedure.
2. Remove the eight screws that secure the keyboard PCB to the bottom cover. Refer to Figure 2-1.
3. Lift the keyboard PCB up and lay it over the back edge of the bottom cover. Refer to Figure 2-2.
4. Disconnect the coiled keyboard cable from the keyboard PCB and remove the cable from its retainers on the inside of the bottom cover. Be careful not to damage the cable by overstressing its tensile strength. Remove the keyboard cable, keyboard PCB, and bottom cover.



0142

Figure 2-1. Keyboard Top Cover Removed





0141

Figure 2-2. Keyboard PCB Removal and Replacement

## SUBASSEMBLY REMOVAL AND REPLACEMENT

### REPLACEMENT

1. Insert the coiled keyboard cable through its access hole in the bottom cover and secure it to its retainers. Be careful not to damage the cable by overstressing its tensile strength. Connect the keyboard cable connector to the keyboard PCB. Refer to Figure 2-1.
2. Install the keyboard PCB in the bottom cover and secure it in place with eight screws. Refer to Figure 2-2.
3. Replace the top cover on the keyboard assembly. Refer to the Keyboard Top Cover Removal and Replacement procedure.

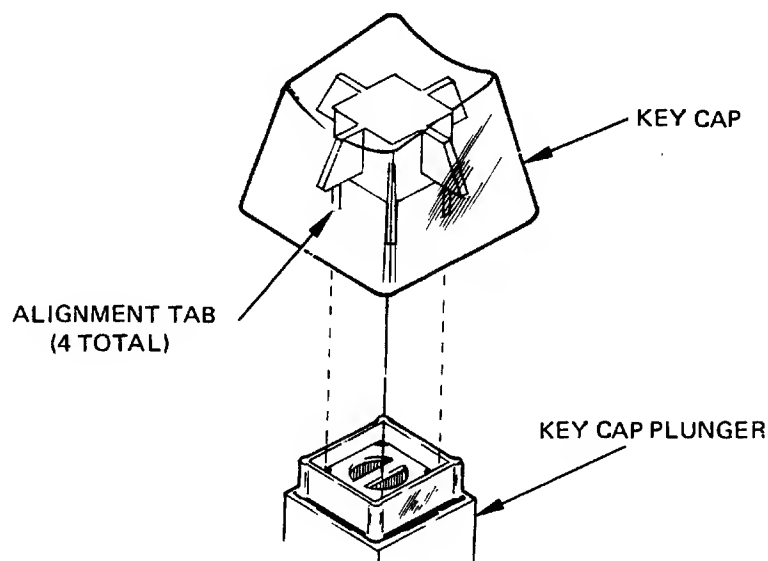
### Key Caps

#### REMOVAL

A key cap can be easily removed by gripping it between index finger and thumb and pulling up. Refer to Figure 2-3.

#### REPLACEMENT

To replace a key cap, position it over its location and press downward with gentle pressure. Be sure to position the key cap so that its four alignment tabs engage the key cap plunger. Refer to Figure 2-3.



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Figure 2-3. Key Cap Removal and Replacement

## SUBASSEMBLY REMOVAL AND REPLACEMENT

### Monitor - Back Cover

#### REMOVAL

To remove the back cover for access to the upper monitor area (CRT and video PCB), proceed as follows. Refer to Figure 2-4.

#### CAUTION

Hazardous voltages are exposed when the Monitor Back Cover is removed. Power OFF the terminal and disconnect the power cord (unless an alignment procedure is to be performed).

Discharge the CRT anode to ground to avoid electrical shock before removing or replacing any upper monitor area subassembly (refer to Step 2 of the Video PCB Removal and Replacement procedure).

Take care when working in the general area of the CRT. Do not scratch or strike the CRT or subject it to unusual pressure. The CRT contains a high vacuum and breakage of the tube may result in injury from flying glass. As a precaution wear suitable clothing with eye protection.

1. Orient the monitor to gain screwdriver access to the bottom edge of the monitor back cover.
2. Remove the two screws that secure the back cover to the monitor, and slide the back cover to the rear until it is free of its support tracks on the display swivel support.

#### REPLACEMENT

1. Install the back cover on the monitor by sliding it into position on the display swivel support. Refer to Figure 2-4.
2. Secure the back cover to the monitor with two screws.

## SUBASSEMBLY REMOVAL AND REPLACEMENT

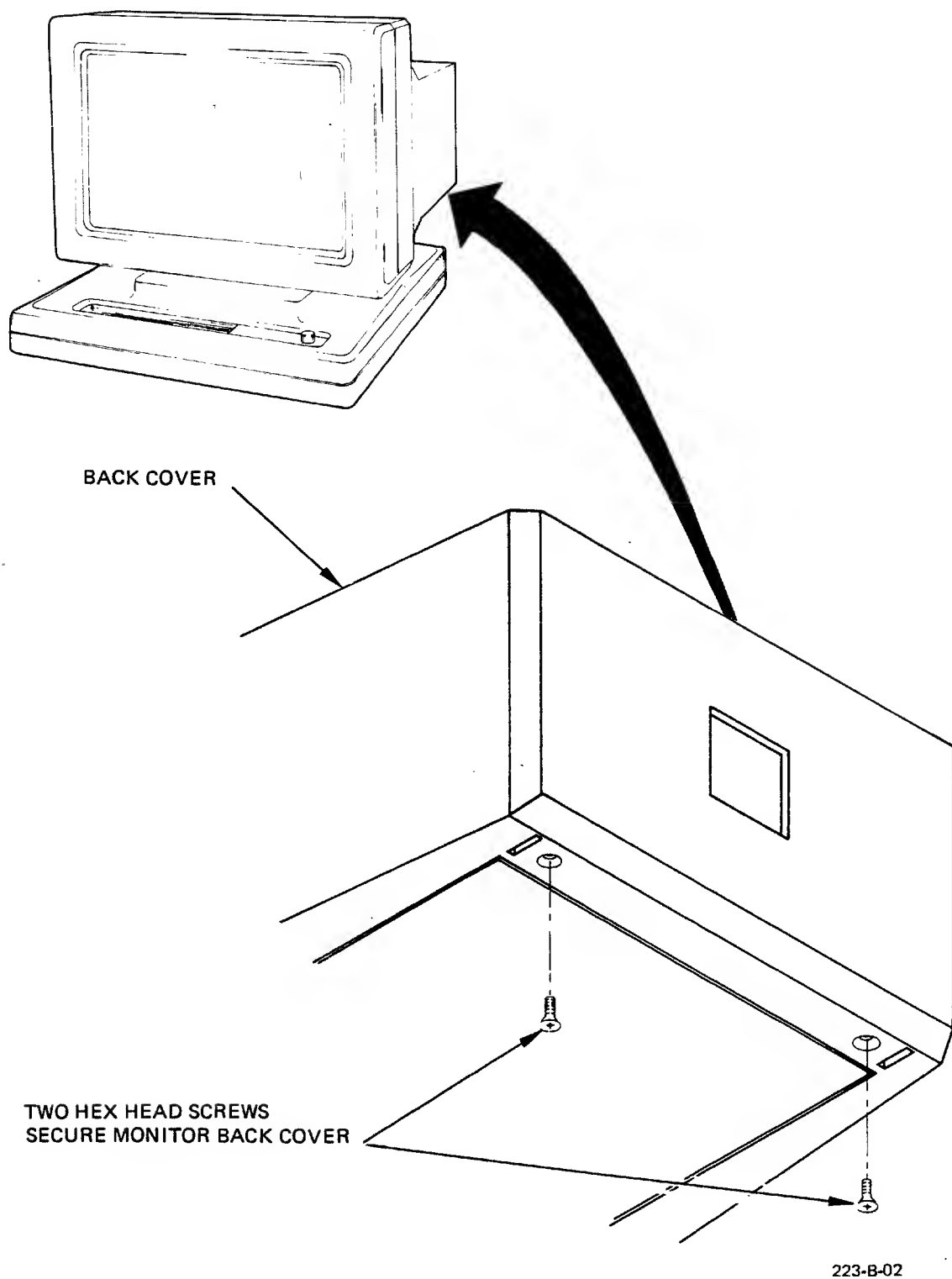


Figure 2-4. Monitor Back Cover Removal and Replacement

## SUBASSEMBLY REMOVAL AND REPLACEMENT

### Monitor - Bottom Cover

#### REMOVAL

To remove the bottom cover for access to the lower monitor area (logic PCB and power supply), proceed as follows. Refer to Figure 2-5.

#### CAUTION

Hazardous voltages are exposed in the general area of the power supply. Before performing any service in the lower monitor area, power OFF the terminal and disconnect the power cord.

1. Remove the knob from the brightness potentiometer.
2. Lay the monitor on its side and loosen the four recessed screws at the corners. These screws are captive screws, so it is not necessary to remove them.
3. Remove the bottom cover from the monitor. To remove any of the subassemblies mounted on the inside of the bottom cover, refer to the appropriate removal procedure.

#### REPLACEMENT

1. Install any subassemblies on the inside of the bottom cover that have been previously removed. Refer to the appropriate replacement procedure.
2. Position the bottom cover on the monitor and tighten the four recessed screws to secure it in place. Refer to Figure 2-5.
3. Install the knob on the stem of the brightness potentiometer.

## SUBASSEMBLY REMOVAL AND REPLACEMENT

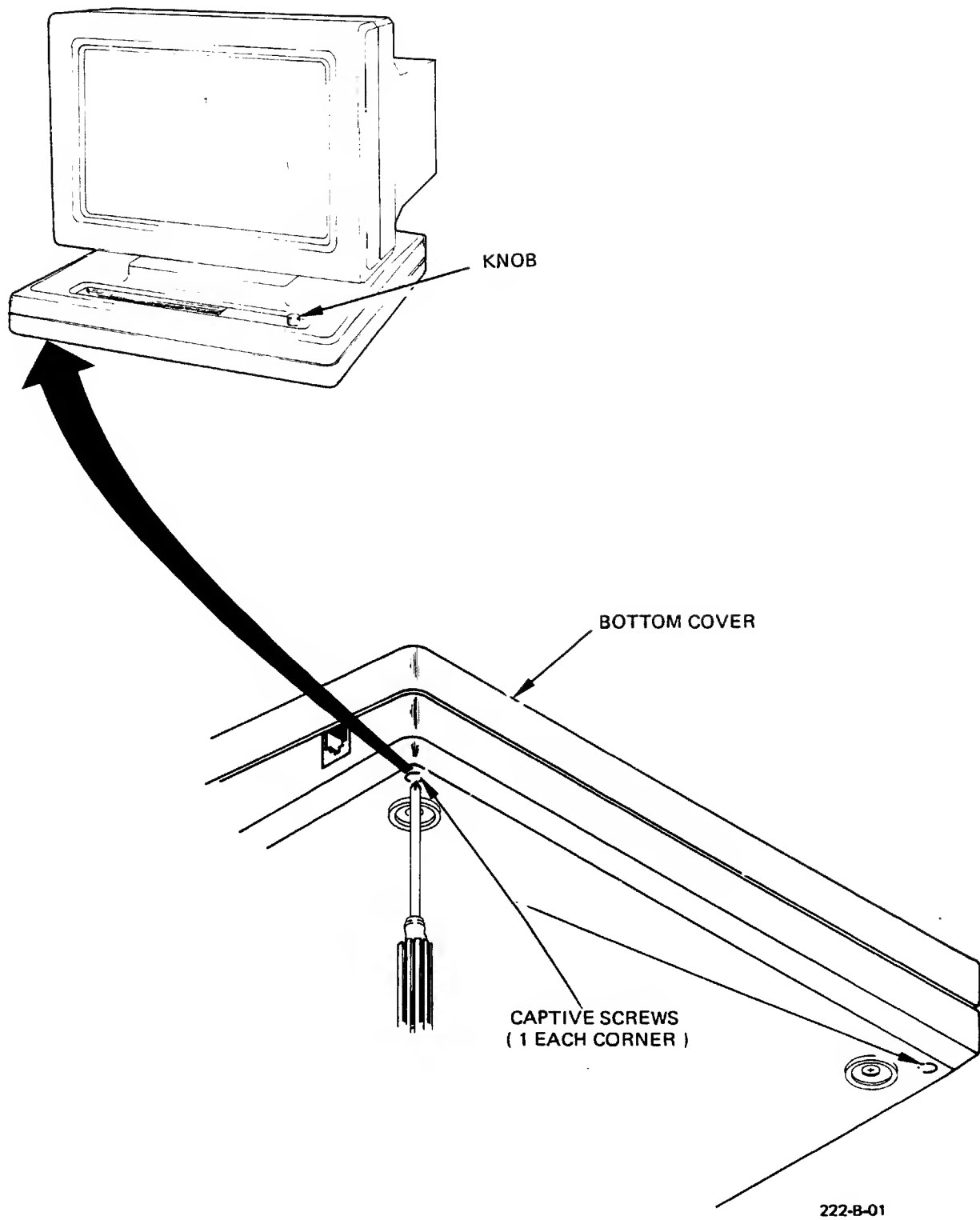


Figure 2-5. Monitor Bottom Cover Removal and Replacement

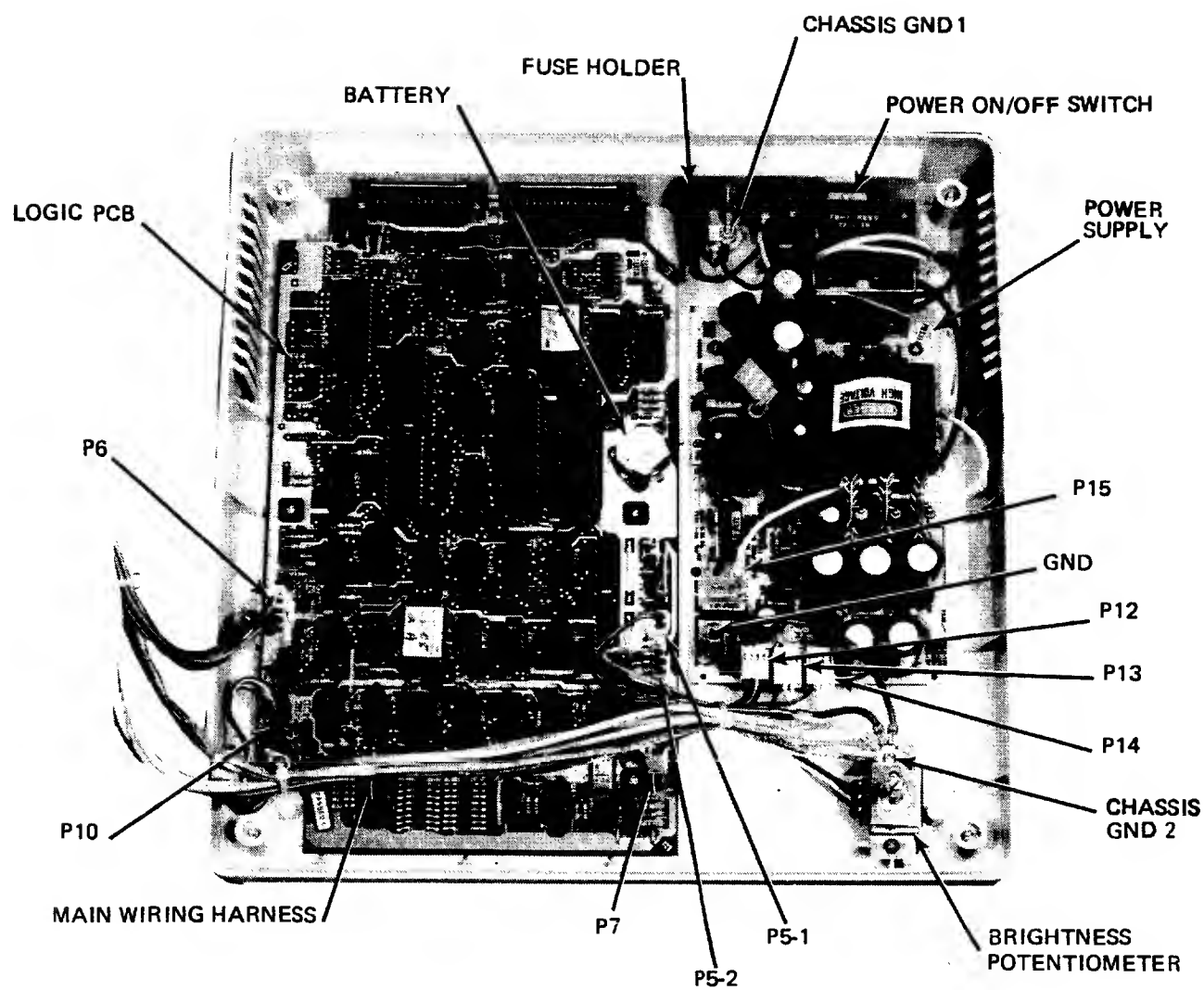
## SUBASSEMBLY REMOVAL AND REPLACEMENT

### LOWER MONITOR AREA SUBASSEMBLIES

The Lower Monitor Area contains the following subassemblies. Refer to Figure 2-6.

- Logic PCB,
- Power Supply,
- Power On/Off Switch,
- Fuse Holder,
- Battery,
- Brightness Potentiometer,
- Main Wiring Harness.

## SUBASSEMBLY REMOVAL AND REPLACEMENT



0139

Figure 2-6. Lower Monitor Area



## Logic PCB

### REMOVAL

#### CAUTION

Hazardous voltages are exposed in the general area of the power supply. Before performing any service in this area, power OFF the terminal and disconnect the power cord.

1. Gain access to the lower monitor area. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.
2. Disconnect the following connectors from the logic PCB. Refer to Figure 2-6.

P5-1	+5 Vdc from the power supply,
P5-2	+12 Vdc from the power supply,
P6	Video PCB,
P7	Brightness potentiometer,
P10	Keyboard input.

3. Remove the 8 screws that secure the logic PCB (and the chassis ground strap on the keyboard input jack) to the bottom cover. Lift the logic PCB from the bottom cover.

### REPLACEMENT

1. Position the logic PCB over its mounting holes in the bottom cover and secure it in place with 8 screws. Be sure to also install the chassis ground strap from the keyboard input jack. Refer to Figure 2-6.
2. Reconnect all connectors listed in the Removal procedure above.
3. Reinstall the bottom cover on the monitor. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.

## Switching Power Supply

### REMOVAL

#### CAUTION

Hazardous voltages are exposed in the general area of the power supply. Before performing any service in this area, power OFF the terminal and disconnect the power cord.

1. Gain access to the lower monitor area. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.
2. Disconnect the following connectors from the power supply. Refer to Figure 2-6.

P12		
P13	>	+5 Vdc and +12 Vdc output connectors,
P14		
P15		Source voltage input,
GND		Power supply ground. (The ground lead on later model power supplies is soldered to the power supply, but easily removable from chassis ground 2.).

3. Remove the four screws that secure the power supply to the bottom cover. Lift the power supply from the bottom cover.

### REPLACEMENT

1. Position the power supply over its mounting holes in the bottom cover and secure it in place with four screws. Refer to Figure 2-6.
2. Reconnect all the connectors listed in the Removal procedure above.
3. Reinstall the bottom cover on the monitor. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.

## SUBASSEMBLY REMOVAL AND REPLACEMENT

### Power On/Off Switch

#### REMOVAL

#### CAUTION

Hazardous voltages are exposed in the general area of the power supply. Before performing any service in this area, power OFF the terminal and disconnect the power cord.

1. Gain access to the lower monitor area. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.
2. Remove the two screws that secure the filter PCB and the power switch with bracket in the bottom cover. Refer to Figure 2-7.
3. Remove the filter PCB; it is not necessary to de-solder its four connecting leads.
4. Note the arrangement of the four leads on the power switch. De-solder these leads and remove the power switch with its mounting bracket.
5. Remove the two screws that secure the power switch to its mounting bracket. Remove the power switch.

#### REPLACEMENT

1. Secure the power switch to its mounting bracket with the two screws removed in Step 5 above. Refer to Figure 2-7.
2. Re-solder the four leads to the power switch.
3. Position the power switch mounting bracket over its mounting holes in the bottom cover. Position the line filter PCB over the power switch mounting bracket so that all mounting holes are in line. Secure in place with the two screws removed in Step 2 above.
4. Reinstall the bottom cover on the monitor. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.

### Fuse Holder

#### REMOVAL

#### CAUTION

Hazardous voltages are exposed in the general area of the power supply. Before performing any service in this area, power OFF the terminal and disconnect the power cord.

## SUBASSEMBLY REMOVAL AND REPLACEMENT

1. Gain access to the lower monitor area. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.
2. Note the arrangement of the two leads on the fuse holder. De-solder these leads from the fuse holder. Refer to Figure 2-7.
3. With a small adjustable wrench, remove the nut and washer that secures the fuse holder to the inside of the bottom cover. Remove the fuse holder.

### REPLACEMENT

1. Install the fuse holder in the bottom cover and secure it in place with the washer and nut removed in Step 3 above. Refer to Figure 2-7.
2. Re-solder the two leads to the fuse holder.
3. Reinstall the bottom cover on the monitor. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.

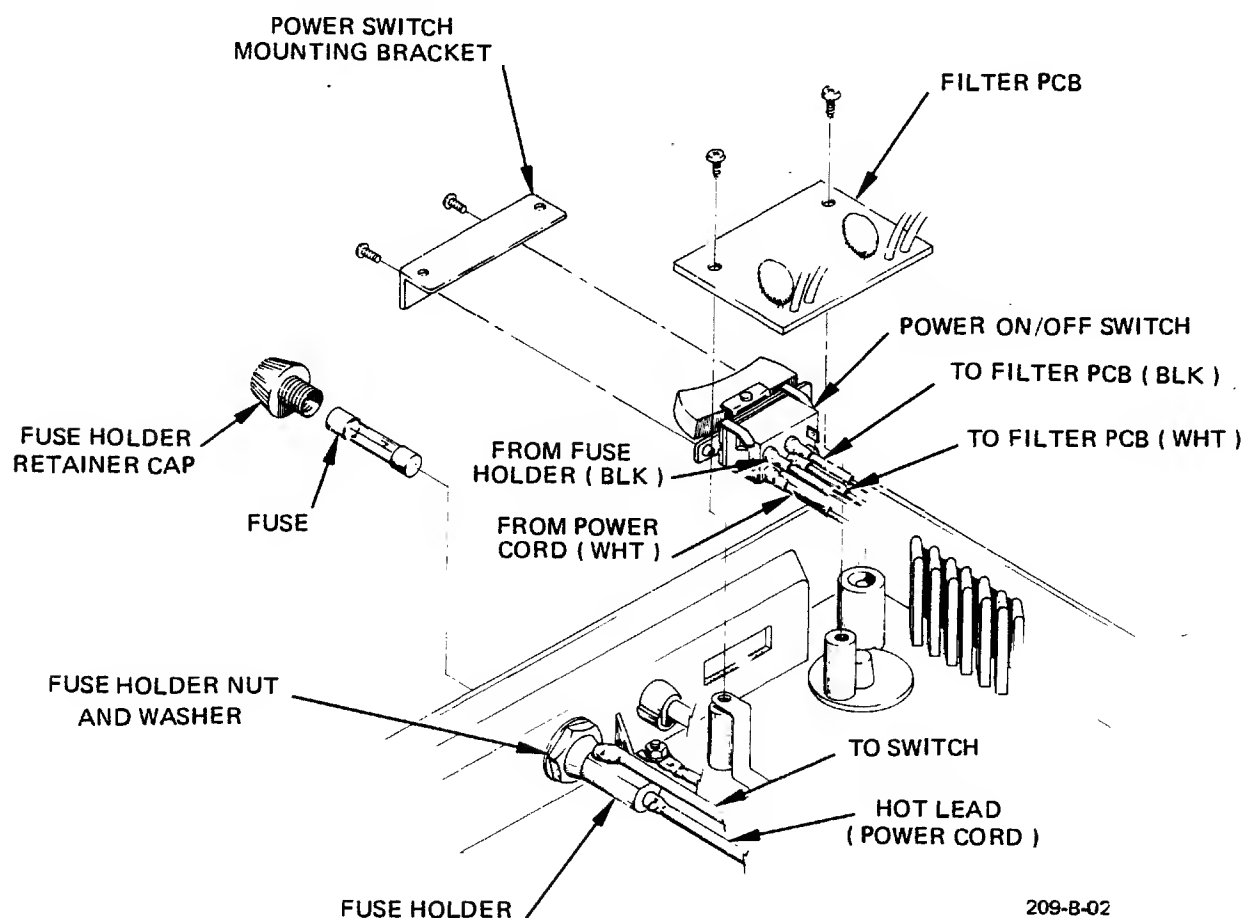


Figure 2-7. Power ON/OFF Switch and Fuse Holder Removal and Replacement

## SUBASSEMBLY REMOVAL AND REPLACEMENT

### Battery

#### REMOVAL AND REPLACEMENT

#### CAUTION

Hazardous voltages are exposed in the general area of the power supply. Before performing any service in this area, power OFF the terminal and disconnect the power cord.

The battery is easily removed and replaced by sliding it in and out of its retainer clip on the Logic PCB (refer to Figure 2-8). As a reference, note the status line set-up configuration of the terminal before removing the battery. Once the battery is replaced, if after power ON the status line appears to be altered, execute a Shift-D and reconfigure the status line as you have noted.

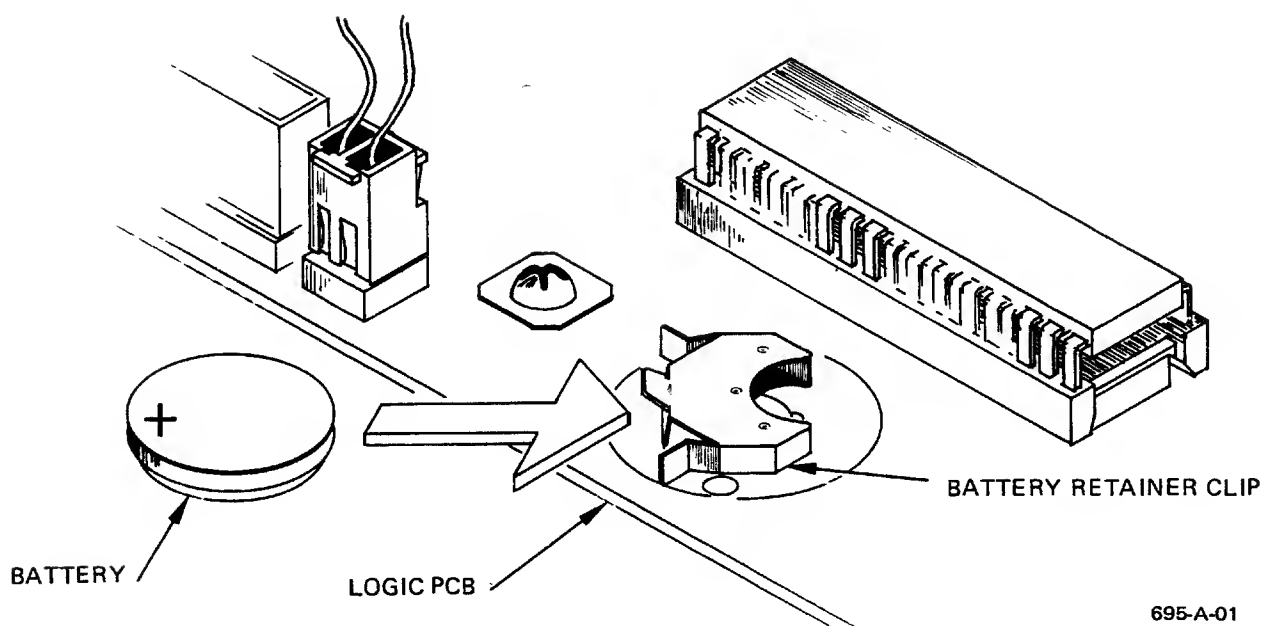


Figure 2-8. Battery Removal and Replacement

## Brightness Potentiometer

### REMOVAL

#### CAUTION

Hazardous voltages are exposed in the general area of the power supply. Before performing any service in this area, power OFF the terminal and disconnect the power cord.

1. Gain access to the lower monitor area. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.
2. Disconnect the brightness potentiometer connector (P7) from the Logic PCB. Refer to Figure 2-6.
3. Remove the two screws that secure the brightness potentiometer and mounting bracket to the bottom cover. Refer to Figure 2-9.
4. With a small adjustable wrench, remove the nut that secures the brightness potentiometer to the mounting bracket. Remove the brightness potentiometer.

### REPLACEMENT

1. Secure the brightness potentiometer to its mounting bracket with the nut removed in Step 4 above. Refer to Figure 2-9.
2. Position the brightness potentiometer with mounting bracket over its mounting holes in the bottom cover. Be sure to orient the mounting bracket so that the high side of its sloped top surface is toward the rear. Secure in place with the two screws removed in Step 3 above.
3. Reconnect the brightness potentiometer connector (P7) to the Logic PCB. Refer to Figure 2-6.
4. Reinstall the bottom cover on the monitor. Refer to the Monitor - Bottom Cover Removal and Replacement procedure.

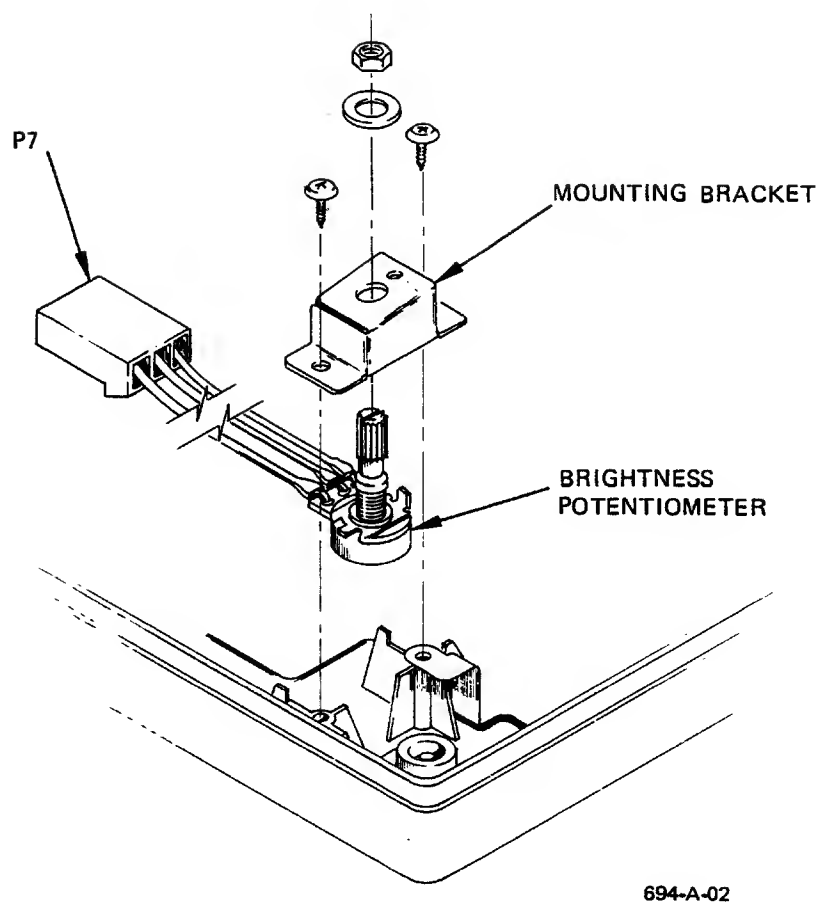


Figure 2-9. Brightness Potentiometer Removal and Replacement

### Main Wiring Harness

The main wiring harness includes all the point-to-point wiring between the major subassemblies of the QVT-102. If removal and replacement of the main wiring harness is required, refer to the QVT-102 Interconnect Wiring Diagram found in the Circuits and Diagrams Section.



## SUBASSEMBLY REMOVAL AND REPLACEMENT

### UPPER MONITOR AREA SUBASSEMBLIES

The Upper Monitor Area contains the following subassemblies. Refer to Figure 2-10.

- Video PCB,
- CRT.

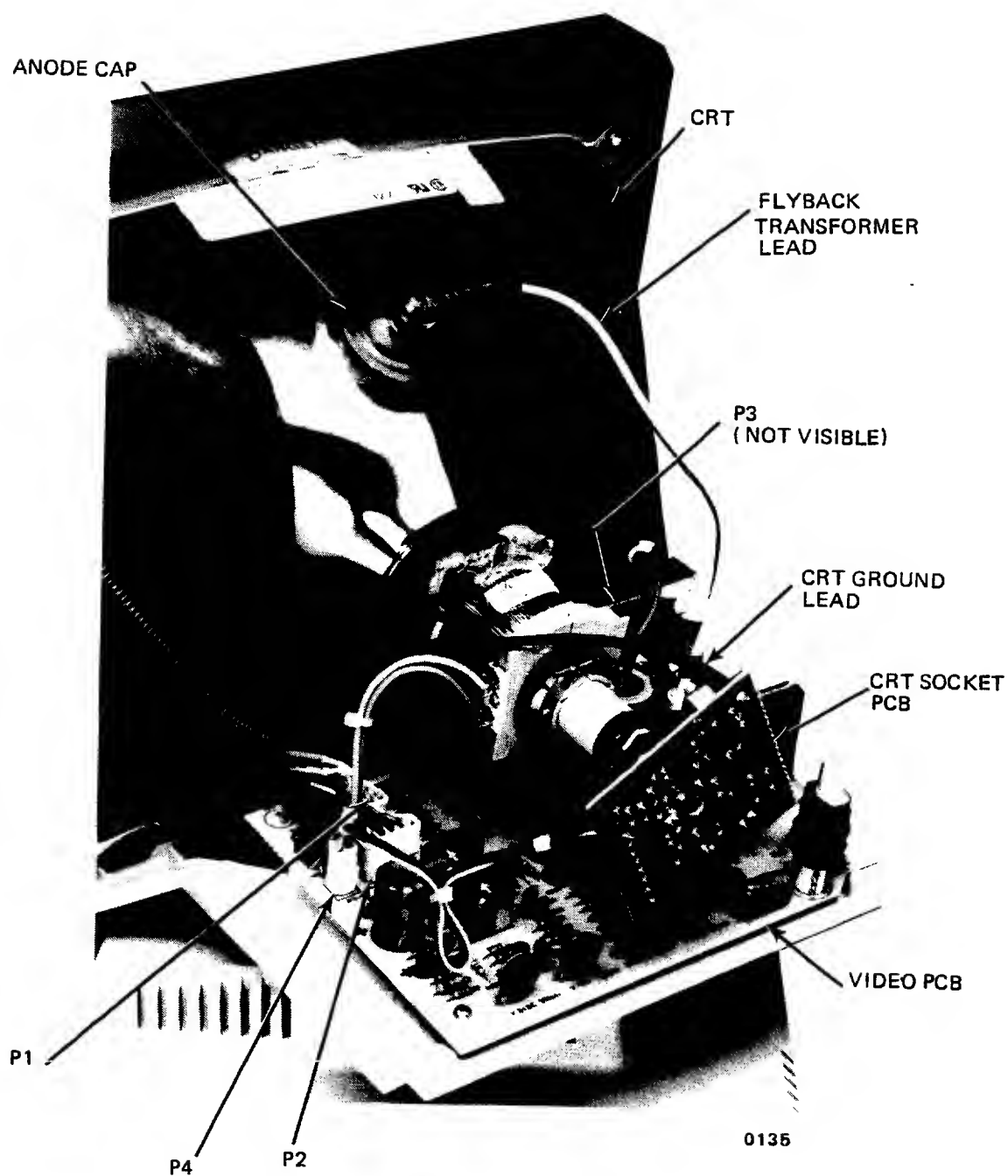


Figure 2-10. Upper Monitor Area

### Video PCB

#### REMOVAL

#### CAUTION

Take special care when working in the general area of the CRT. Do not scratch or strike the CRT or subject it to unusual pressure. The CRT contains a high vacuum and breakage of the tube may result in injury from flying glass. As a precaution wear suitable clothing and eye protection.

1. Gain access to the upper monitor area. Refer to the Monitor - Back Cover Removal and Replacement procedure.
2. Discharge the CRT high voltage circuit and remove the flyback transformer anode cap. Figure 2-11 illustrates the proper method of discharging the CRT anode by using the shaft of an insulated screwdriver, to short the anode to the metalized surface of the CRT.
3. Disconnect the following connectors from the video PCB. Refer to Figure 2-10.

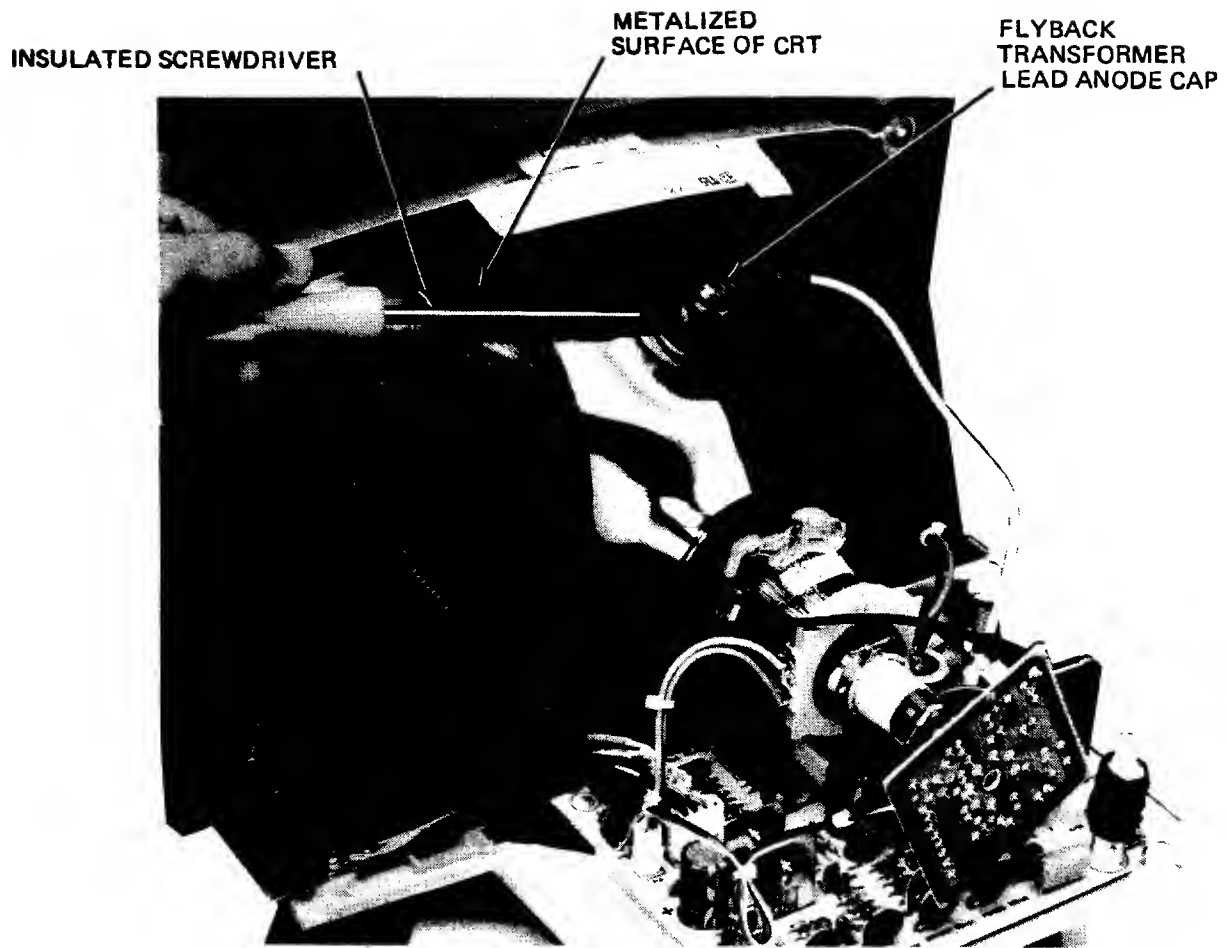
P1	+12 Vdc,
P2	Horizontal and vertical sync,
P3	Horizontal yoke deflection,
P4	Vertical yoke deflection,
GND	CRT grounding spring.

4. Remove the five screws that secure the video PCB in place, and remove the CRT socket PCB from the neck of the CRT. Remove the video PCB from the monitor.

#### REPLACEMENT

1. Place the video PCB over its mounting holes, and install the CRT socket PCB on the neck of the CRT. Secure the video PCB with five screws.
2. Install the flyback transformer lead on the CRT.
3. Reconnect all connectors listed in the Removal procedure above.
4. Perform any video alignments necessary.
5. Reinstall the back cover on the monitor. Refer to the Monitor - Back Cover Removal and Replacement procedure.

## SUBASSEMBLY REMOVAL AND REPLACEMENT



0134

Figure 2-11. Discharging the CRT Anode

## SUBASSEMBLY REMOVAL AND REPLACEMENT

### CRT

#### REMOVAL

#### CAUTION

Take special care when working in the general area of the CRT. Do not scratch or strike the CRT or subject it to unusual pressure. The CRT contains a high vacuum and breakage of the tube may result in injury from flying glass. As a precaution wear suitable clothing and eye protection.

1. Gain access to the upper monitor area. Refer to the Monitor - Back Cover Removal and Replacement procedure.
2. Discharge the CRT high voltage circuit and remove the flyback transformer anode cap. Figure 2-11 illustrates the proper method of discharging the CRT anode by using the shaft of an insulated screwdriver, to short the anode to the metalized surface of the CRT.
3. Disconnect connectors P3 and P4 (horizontal and vertical yoke deflection leads) from the video PCB. Refer to Figure 2-10.
4. Disconnect the CRT ground lead from the CRT socket PCB, and remove the socket PCB from the neck of the CRT.
5. Support the CRT and remove the four screws that secure it in the display swivel support. Remove the CRT from the monitor cabinet. Remove the grounding spring from the CRT.

#### REPLACEMENT

1. Install the grounding spring between the CRT upper left and lower right mounting tabs. Then position the CRT over its mounting holes in the display swivel support and secure it with the four screws removed in Step 5 above.
2. Install the CRT socket PCB on the neck of the CRT. Connect the ground lead from the CRT grounding spring to the CRT socket PCB. Refer to Figure 2-10.
3. Install connectors P3 and P4 on the video PCB.
4. Reconnect the flyback transformer anode cap to the CRT.
5. Perform any video alignments necessary.
6. Reinstall the back cover on the monitor. Refer to the Monitor - Back Cover Removal and Replacement procedure.

## SECTION 3

# ALIGNMENT

## INTRODUCTION

The alignment parameters presented in this section are to be regarded as guidelines only and not as specifications criteria.

Video alignment of the QVT-102 is divided into the following alignment procedures. Note: These alignment procedures may be performed in any order.

- Horizontal Display Width,
- Vertical Display Height,
- Display Centering (Raster Tilt),
- Horizontal Linearity (Uniform Character Width),
- Vertical Linearity (Uniform Character Height),
- Brightness,
- Focus.

## TOOLS AND EQUIPMENT REQUIRED

The following tools are required to perform video alignment of the QVT-102:

- Phillips Screwdriver,
- Small, Slotted, Non-metallic Screwdriver,
- QVT Alignment Tools Set (Q.P.N. 84841-XX),
  - . Display Template (refer to Figure 3-1a, Q.P.N. 84841-01),
  - . Vertical Template (refer to Figure 3-1b, Q.P.N. 84841-02),
  - . Horizontal Template (refer to Figure 3-1b, Q.P.N. 84841-03),
  - (A metric rule may be used in place of the above three templates.)
  - . 7/64 inch Alignment Tool (Q.P.N. 84841-04),
- Multimeter (for brightness and focus alignment procedures),
- Oscilloscope (for focus alignment procedure only).

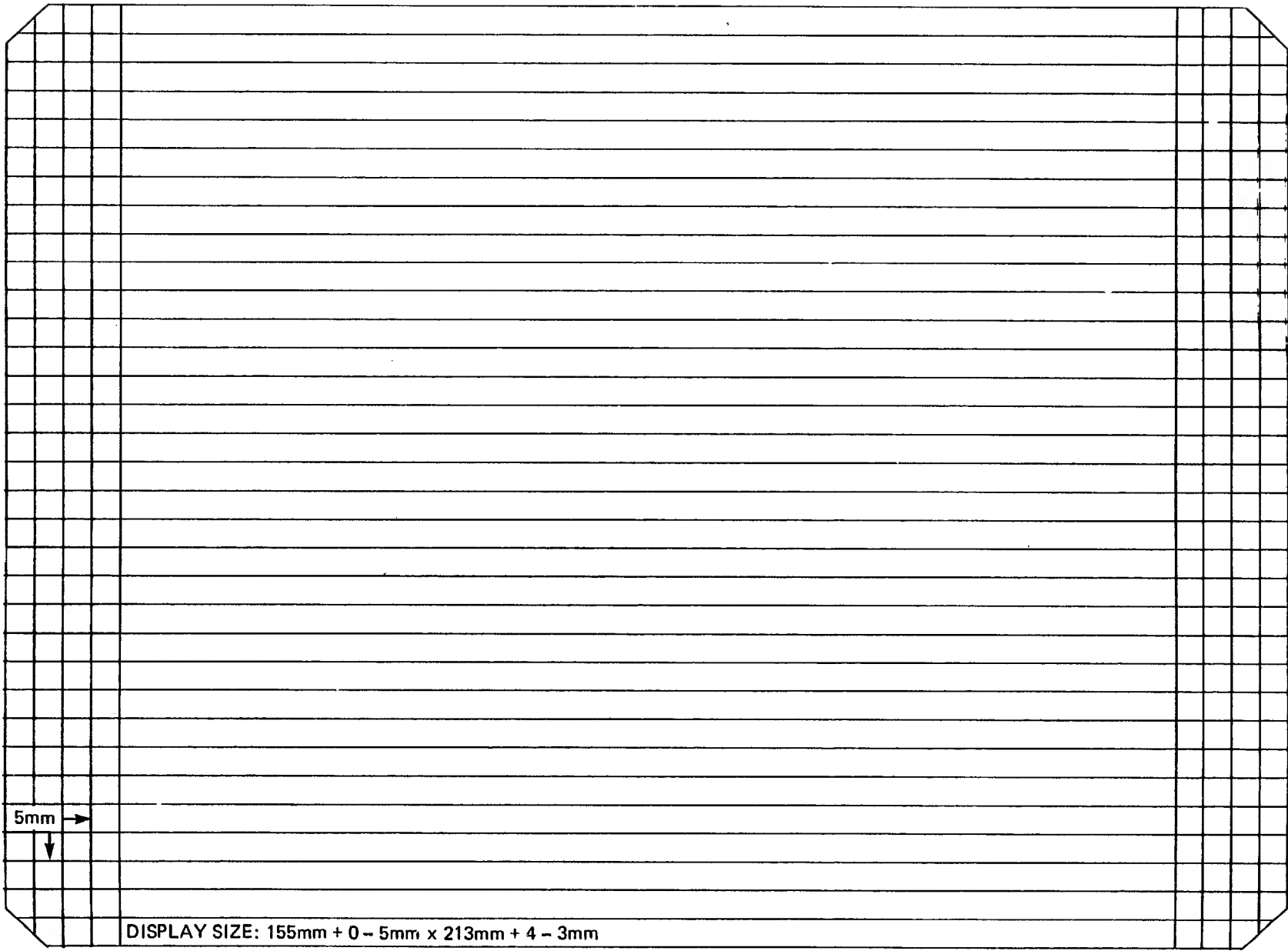
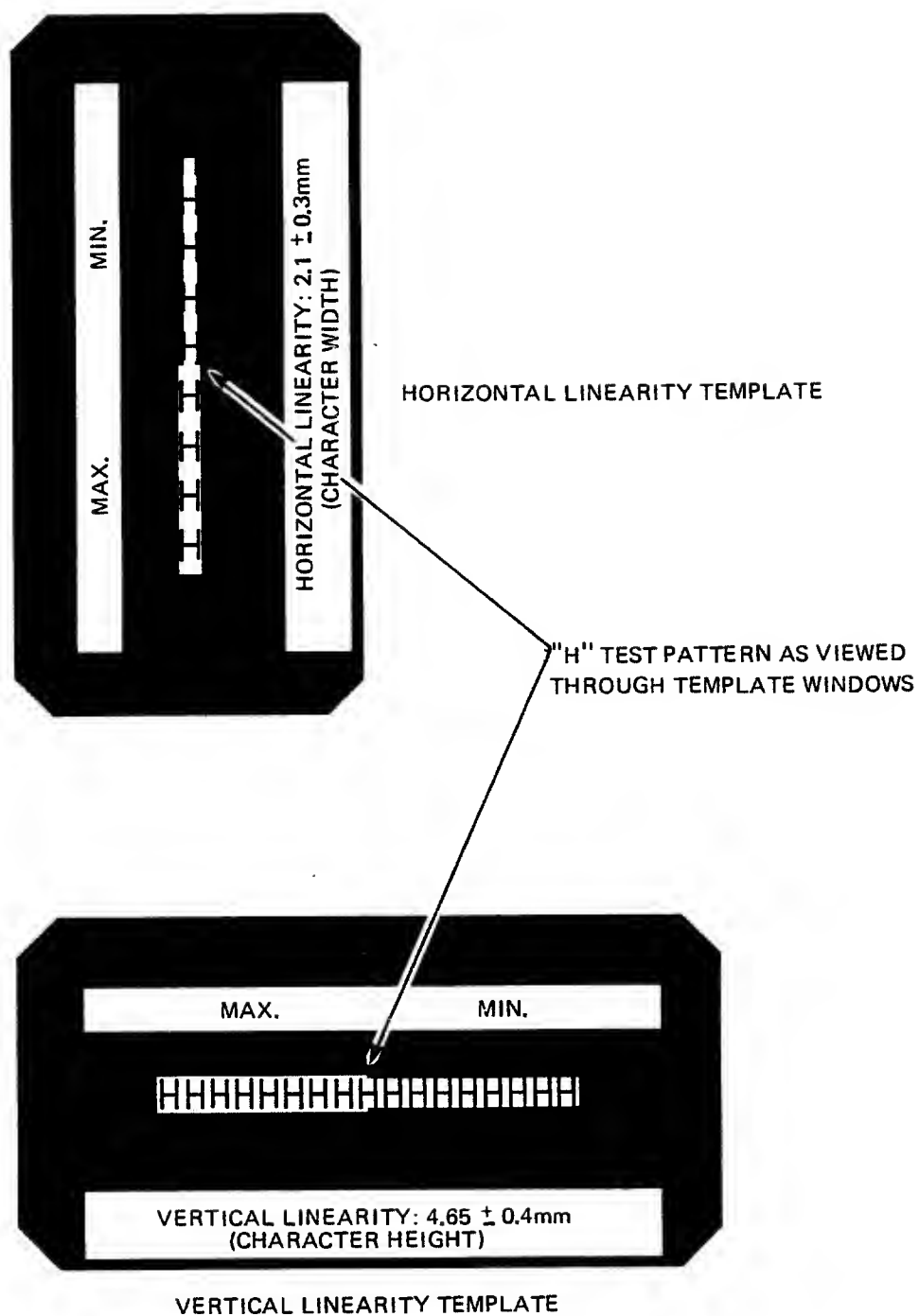


Figure 3-1a. QVT Alignment Tools Set (Display Template, Q.P.N. 84841-01)



787-A

Figure 3-1b. QVT Alignment Tools Set  
(Vertical Template, Q.P.N. 84841-02; Horizontal Template, Q.P.N. 84841-03)



## ALIGNMENT

### ALIGNMENT CONDITIONS

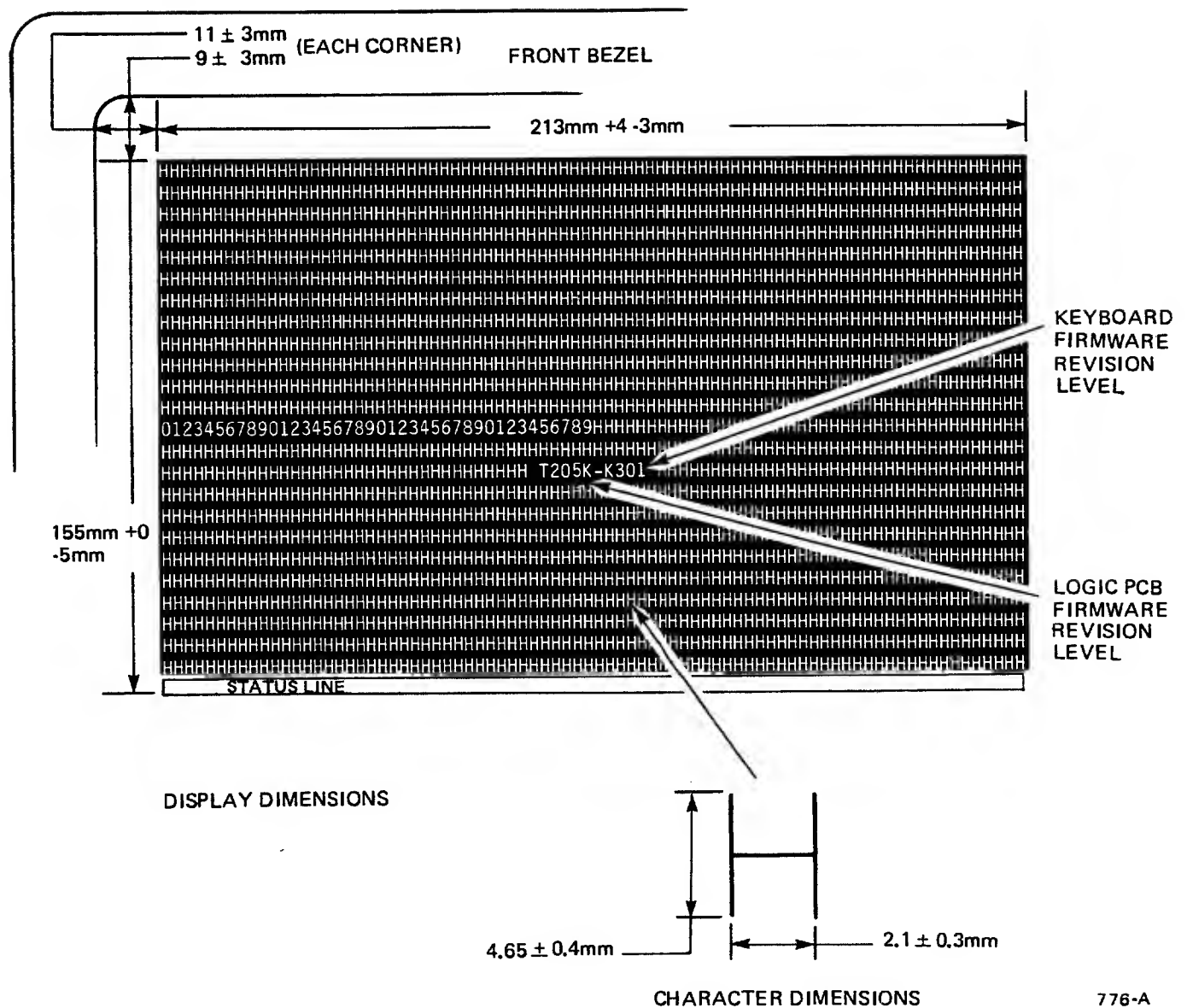
All alignment procedures should be thoroughly read and only performed under the following conditions:

- Warm-up. Allow the terminal to stabilize at its operating temperature; approximately ten minutes.
- Back cover removed. Refer to the Monitor - Back Cover Removal and Replacement procedure.
- Local Mode. Configure the terminal for local mode operation.
- Standard Video/Reverse Video. Perform all alignment procedures in the terminal's normal operating display condition.
- "H" Test Pattern displayed. The terminal has a built-in test pattern that displays a full screen of "Hs," and identifies the firmware revision level. To display the "H" test pattern, simultaneously depress the Ctrl/Shift/Setup keys followed by the zero key. Refer to Figure 3-2.

### CAUTION

Take care when handling the CRT. Do not scratch or strike the CRT or subject it to unusual pressure. The CRT contains a high vacuum and breakage of the tube may result in injury from flying glass. As a precaution wear suitable clothing with eye protection.

Hazardous voltages are present in the general area of the flyback transformer lead and the CRT anode cap. Exercise caution to avoid electrical shock when performing any video alignment procedure. Remember that the terminal is powered ON.



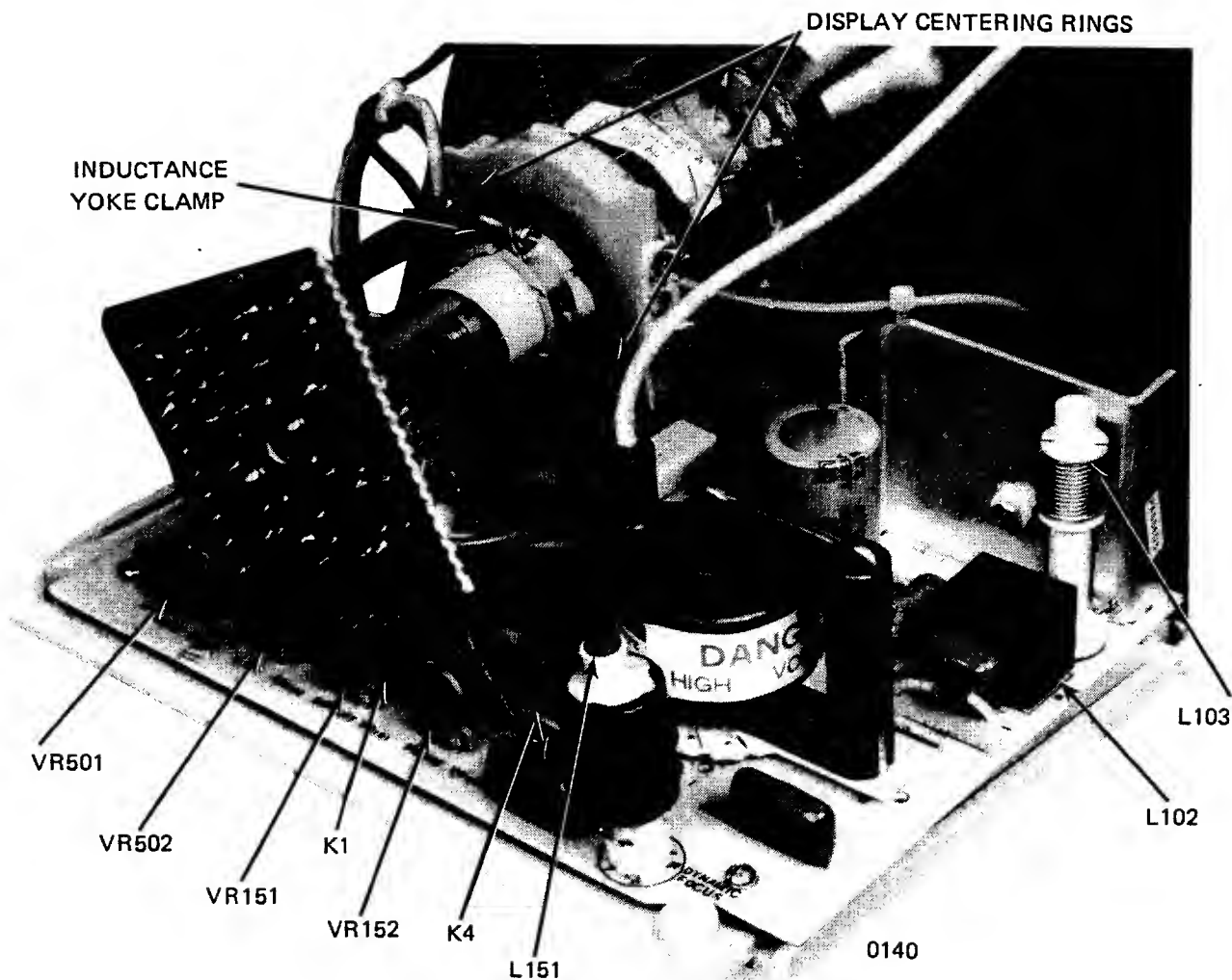
776-A

Figure 3-2. The "H" Test Pattern

## ALIGNMENT

### VIDEO ALIGNMENT PROCEDURES

Video alignment of the QVT-102 is accomplished by adjusting one or more of the adjustments illustrated in Figure 3-3. Each alignment procedure is described below.



#### LEGEND

VR501	Vertical Display Height
VR502	Vertical Linearity
VR151	Brightness
VR152 and L151	Focus
L103	Horizontal Display Width
L102	Horizontal Linearity
K1 and K4	Test Points
Rings and Clamp	Display Centering

Figure 3-3. Video Alignments

**Horizontal Display Width (Line Width)**

Horizontal display width is correctly adjusted when the width of a line of Hs in the "H" test pattern measures  $213 \text{ mm} + 4 - 3 \text{ mm}$ . If adjustment is required, proceed as follows:

1. Display the "H" test pattern (Ctrl/Shift/Setup-Zero).
2. Measure the first line of Hs with the Display Template (Q.P.N. 84841-01). Tape the template to the front bezel so that it is securely held in place over the display screen. A metric rule may be used if the template is not available.
3. If adjustment is required, rotate inductor L103 on the Video PCB (refer to Figure 3-3) with the 7/64 inch Alignment Tool (Q.P.N. 84841-04). Clockwise rotation of L103 increases line width and counter-clockwise rotation reduces line width.

**Vertical Display Height**

Vertical display height is correctly adjusted when a column of Hs in the "H" test pattern measures  $155 \text{ mm} + 0 - 5 \text{ mm}$  from the bottom of the status line to the top of a an H character on the first line. If adjustment is required, proceed as follows:

1. Display the "H" test pattern (Ctrl/Shift/Setup-Zero).
2. Display the status line (Set 5 Status Line selection, or ESC } ).
3. Measure the display height of a column with the Display Template (Q.P.N. 84841-01). Tape the template to the front bezel so that it is securely held in place over the display screen. A metric rule may be used if the template is not available.
4. If adjustment is required, rotate pot VR501 on the Video PCB (refer to Figure 3-3) with a small non-metallic screwdriver. Clockwise rotation of VR501 increases display height and counter-clockwise rotation reduces display height.
5. If desired, blank the status line (Set 5 Status Line selection, or ESC { ).

**Display Centering (Raster Tilt)**

The display is considered to be centered and not tilted when the bottom edge of the status line and the top edge of the first line of Hs in the "H" test pattern measures  $9 \pm 3 \text{ mm}$  from the bezel, and the left and right edges of the pattern measures  $11 \pm 3 \text{ mm}$  from the bezel. If adjustment is required, proceed as follows:

1. Display the "H" test pattern (Ctrl/Shift/Setup-Zero).

2. Position the Display Template (Q.P.N. 84841-01) over the "H" test pattern. Tape the template to the front bezel so that it is securely held in place. A metric rule may be used if the template is not available.
3. If a display centering adjustment is required, rotate the centering rings (refer to Figure 3-3) on the yoke of the CRT to center the display. If a gross centering adjustment of the display is required, loosen the inductance yoke clamp and verify that it is as far forward as possible on the neck of the CRT. Re-tighten the clamp, being careful not to over tighten it, and then repeat the centering adjustment with the centering rings.

### Horizontal Linearity (Uniform Character Width)

Horizontal linearity, or uniform character width, is considered to be properly adjusted when a sampling of measurements taken at various locations of the "H" test pattern, reveals a character width of  $2.1 \pm 0.3$  mm. If adjustment is required, proceed as follows:

1. Display the "H" test pattern (Ctrl/Shift/Setup-Zero).
2. Measure character width at five locations in the test pattern (near each corner and the center). If the Vertical Template (Q.P.N. 84841-02) is used, proper character width will appear too large for the Minimum window and too small for the Maximum window. A metric rule may be used if the template is not available.
3. If adjustment is required, locate inductor L102 on the Video PCB (refer to Figure 3-3). Using a small non-metallic screwdriver, rotate L102 clockwise to increase character width or counter-clockwise to reduce character width.

### Vertical Linearity (Uniform Character Height)

Vertical linearity, or uniform character height, is considered to be properly adjusted when a sampling of measurements taken at various locations of the "H" test pattern, reveals a character height of  $4.65 \pm 0.4$  mm. If adjustment is required, proceed as follows:

1. Display the "H" test pattern (Ctrl/Shift/Setup-Zero).
2. Measure character height at five locations in the test pattern (near each corner and the center). If the Horizontal Template (Q.P.N. 84841-03) is used, proper character height will appear too high for the Minimum window and too low for the Maximum window. A metric rule may be used if the template is not available.
3. If adjustment is required, locate pot VR502 on the Video PCB (refer to Figure 3-3). Using a small non-metallic screwdriver, rotate VR502 clockwise to increase character height or counter-clockwise to reduce character height.

## Brightness

Display brightness can be adjusted as follows:

1. Clear the screen of all data by depressing the Shift and Clear/Home keys.
2. Rotate the external brightness control on the display module pedestal fully counter-clockwise.
3. Locate pot VR151 on the Video PCB (refer to Figure 3-3), and with a small non-metallic screwdriver, rotate it until the background raster is just visible.
4. Locate test point K1 on the Video PCB (refer to Figure 3-3) and measure the DC voltage between K1 and ground. Note: This voltage may be a positive or negative voltage. Record the voltage observed.
5. Rotate pot VR151 to reduce the voltage observed between K1 and ground by 2 volts.

## Focus

Display focus can be adjusted as follows:

1. Display the "H" test pattern (Ctrl/Shift/Setup-Zero).
2. Set the oscilloscope controls as follows:
  - Volts/Div..... 100
  - Ms/Div..... 10
  - Coupling..... DC
  - Trigger..... CH1
  - Connect the signal probe to the junction of R154 and C156 (test point K4) on the Video PCB (refer to Figure 3-3). Connect the probe ground to ground.
3. Locate inductor L151 on the Video PCB (refer to Figure 3-3), and with the 7/64 inch Alignment Tool (Q.P.N. 84841-04), adjust L151 for a sine wave having an amplitude of approximately 250 volts peak-to-peak.
4. Locate pot VR152 on the Video PCB (refer to Figure 3-3), and with a small non-metallic screwdriver, adjust VR152 for optimum focus at the center of the display. Optimum focus occurs when the individual dots that form a character are well defined and clear.
5. Observe the scope and record the voltage offset between the negative peak of the sine wave and the ground reference. Record this value as amplitude "A".
6. Adjust pot VR152 for optimum focus near the corners of the display.

## ALIGNMENT

7. Observe the scope and record the voltage offset between the positive peak of the sine wave and the ground reference. Record this value as amplitude "B".
8. Subtract amplitude "A" from amplitude "B" to obtain amplitude "C". That is:  $B - A = C$ .
9. Adjust inductor L151 until the peak-to-peak voltage of the sine wave equals the value of amplitude "C".
10. Adjust pot VR152 until the negative peak of the sine wave is offset from the ground reference by the value "A".
11. Observe the screen display and visually make any fine adjustments necessary.

## SECTION 4

### **PARTS**

This section presents an overall exploded view diagram of the QVT-102 for parts identification, followed by a list of recommended spares.



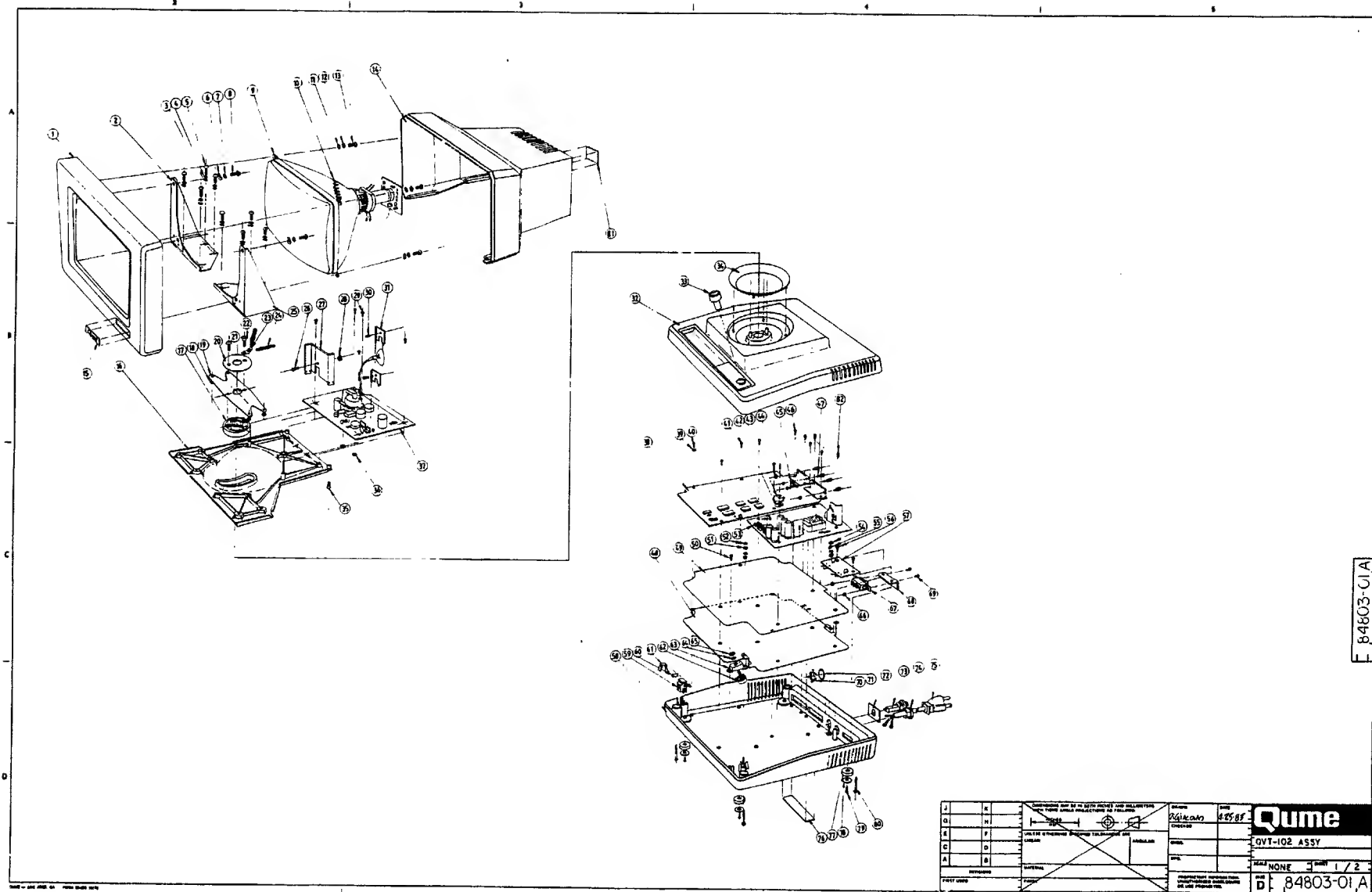


Figure 4-1. QVT-102 Exploded View Diagram

ITEM	QUME P/N	DESCRIPTION		VENDOR'S P/N
1	10,000	FRONT PANEL	X	FACT1020004
2	10,001	TUBE SUPPORT (R)	X	ECT1021210
3	10,002	WASHER (FLAT) M4	X	MC100000409
4	10,003	WASHER (SPRING) M4 X 0.7 X 1	X	MC100000206
5	10,004	SCREW M4 X 0.7 X 5	X	MAA20003200
6	10,005	WASHER (FLAT) M4	X	MC100000409
7	10,006	WASHER (SPRING) M4 X 0.7 X 1	X	MC100000206
8	10,007	SCREW M4 X 0.7 X 10	X	MAA20007205
9	10,008	CAT C67452 120 31V R3	X	AL300000500
10	10,009	GROUND SPRING	X	EX1000001502
11	10,010	WASHER (FLAT) M4	X	MC100000409
12	10,011	WASHER (IN LOCK)	X	MC500000800
13	10,012	N4 X 0.5 X 10.45	X	
14	10,013	SCREW M4 X 0.7 X 10	X	MAA20007205
15	10,014	UPPER CABINET	X	FAAT1020000
16	10,015	LOGO NR	X	EJ3000009101
17	10,016	TILT NECK	X	FALT1020003
18	10,017	SLIDE BLOCK	X	FC000110008
19	10,018	SLIDE CHIR	X	FC000100002
20	10,019	PRESSURE SPRING	X	EX030000102
21	10,020	WASHER (SLIDE F)	X	FC000150009
22	10,021	SCREW M4 X 0.7 X 10	X	MAA20007205
23	10,022	WASHER (NECK FIX)	X	MAA50001203
24	10,023	SPRING HOOK (NECK)	X	EX030000307
25	10,024	TENSION SPRING	X	EX100000166
26	10,025	TUBE SUPPORT (L)	X	ECT1021105
27	10,026	SCREW M3 X 0.5 X 10	X	MAA20009206
28	10,027	HEAT SINK AL-5	X	LC040000402
29	10,028	NUT M3 X B5.5 X H2.4	X	MO200000108
30	10,029	SCREW M3TPA X 5	X	MAA20003204
31	10,030	SCREW M3 X 0.5 X 5	X	MAA20003205
32	10,031	HEAT SINK FE-1	X	LC040000106
33	10,032	BOTTOM U CAB	X	FANT1020008
34	10,033	VR KNOB	X	FB210210001
35	10,034	SLIDE RING	X	FC000070006
36	10,035	SCREW M4 X 0.7 X 10	X	MAA40001202
37	10,036	(C/SINK)	X	
38	10,037	NUT NO. 4-40 UNC	X	MD2000000701
39	84501-01	VIOLO PCB VB-2 REV 4B	X	QAIT102V203
40	84502-01	LOGIC BOARD LB-4 REV 4B	X	QAIT102L103
41	10,038	WASHER M5 (EX. LOCK)	X	MC500000101
42	10,039	SCREW M3TPA X 10	X	MAA20003200
43	10,040	SCREW M3TPA X 5	X	MAA20003204
44	10,041	BATTERY POLE (-)	X	EF02102105
45	10,042	BATTERY POLE (+)	X	EF01102105
46	10,043	NUT M3 X B5.5 X H2.4	X	MO200000108
47	10,044	GROUND PLATE	X	EF10102104
48	10,045	SCREW M3TPA X 11	X	MAA20018203
49	10,046	SCREW (D-TYPE CONN)	X	MAA50002104
50	10,047	ESD (PLATE)	X	EF10102201
51	10,048	INSULATION FILM (ESD)	X	EL3000000004
52	10,049	SCREW M3TPA X 5	X	MAA20003204
53	10,050	WASHER (EX LOCK) M3	X	MC300000201
54	10,051	NUT M3 X B5.5 X H2.4	X	MO200000108
55	10,052	SWITCHING POWER B	X	POT10200001
56	84604-01	ASTEC-ACDISI	X	
57	10,053	NUT M3 X B5.5 X H2.4	X	MO200000108
58	10,054	WASHER (EX LOCK) M3	X	MC300000201
59	10,055	SCREW M3TPA X 10	X	MAA20003200
60	10,056	PCB FB1 REV0	X	DALT1020005

ITEM	QUME P/N	DESCRIPTION		VENDOR'S P/N
61	10,044	BOTTOM L.CAB	X	FANT1020007
62	10,045	TL MOD JACK BERR 63902-004	X	OL070000201
63	10,046	INSULATION FILM (T/J)	X	EL3000000004
64	10,047	T/J COVER	X	LC080000907
65	84501-01	VR. VIGL4 N2SKC-B5K	X	CF160011002
66	10,048	VR. SUPPORT	X	ECT10231104
67	10,049	WASHER M7	X	
68	10,050	NUT M7	X	
69	10,051	NUT M3 X B5.5 X H2.4	X	MO200000108
70	10,052	SWITCH TB23 5B	X	OE412000101
71	10,053	P.S. SUPPORT	X	ECT10231106
72	10,054	SCREW M3 X 0.5 X 5	X	MAA20003204
73	10,055	NUT (FUSE HOLDER)	X	
74	10,056	WASHER (FUSE HOLDER)	X	
75	10,057	FUSE NP	X	EJA00002004
76	10,058	FUSE HOLDER (L)	X	OL010000107
77	10,059	SNK S-N1301-5	X	
78	10,060	BUSHING HEVCO1214	X	EL000161209
79	10,061	BRGL-1	X	
80	10,062	POWER CORD SET	X	GA030010012
81	10,063	SERIAL NAMEPLATE	X	EJA00010001
82	10,064	R.S. CUSHION WASHER	X	LC100000409
83	10,065	CUSHION	X	LC090000100
84	10,066	SCREW M3TPA X 10 (C. SUNK)	X	MAA40001609
85	10,067	SCREW M4 X 0.7 X 14 (HALF)	X	MAA10004206
86	10,068	RATING NAME	X	EJA00009105
87	10,069	SCREW M3TPA X 5	X	MAA20003204

## NOTE

Replacement parts are limited to those listed on the Recommended Spare Parts List.

NOTES: UNLESS OTHERWISE SPECIFIED.

[X] X INDICATES TO PURCHASE FROM VENDOR (NOT A QUME PART).

QUME		QVT-102	
PARTS LIST		SCALE: 1/2" = 1"	
REV: 1		DATE: 1-15-99	
BY: [Signature]		CHECKED: [Signature]	
APPROVED: [Signature]		DATE: 1-15-99	
PARTS LIST		SCALE: 1/2" = 1"	
REV: 1		DATE: 1-15-99	
BY: [Signature]		CHECKED: [Signature]	
APPROVED: [Signature]		DATE: 1-15-99	

Figure 4-1. QVT-102 Exploded View Diagram (Cont)

**RECOMMENDED SPARE PARTS**

Table 4-1 identifies all QVT-102 recommended spare parts.

Table 4-1. Recommended Spare Parts

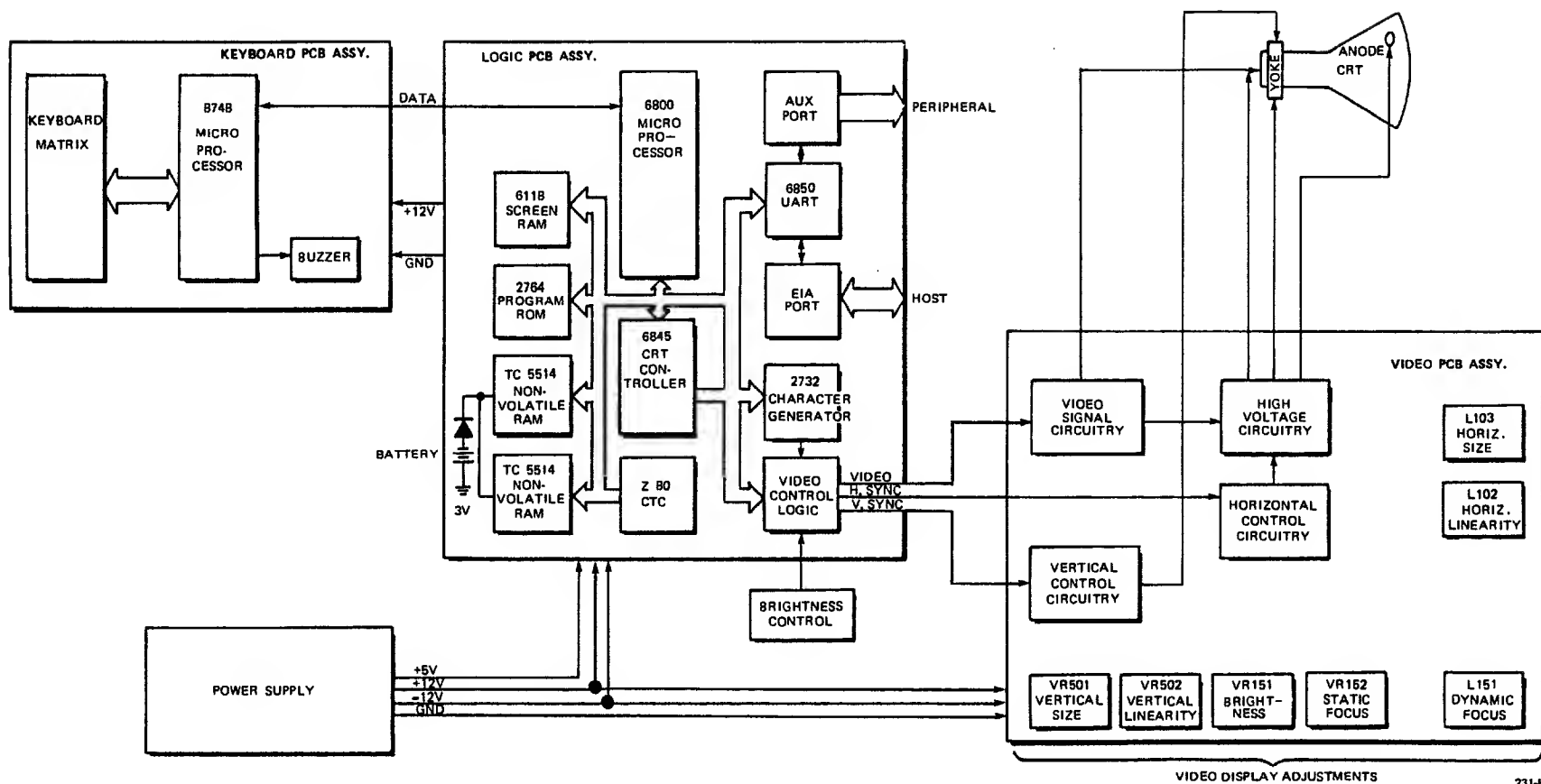
PART NUMBER	DESCRIPTION	QTY PER 1000	QTY PER 10,000
84807-01	Brightness Potentiometer Assembly	15	50
84804-01	Power Supply Assembly	25	150
84805-01	AC Line Switch	15	50
84800-01	Logic PCB Assembly, RS-232-C	25	150
84800-02	Logic PCB Assembly, Current Loop	5	10
84806-01	Battery, RAM Back-up	10	25
84803-01	CRT, Green	5	25
84803-02	CRT, Amber	3	15
84811-01	Keyboard Assembly	25	150
84801-01	Video PCB Assembly	25	150
10028	Brightness Potentiometer Knob	10	50
10244	Coiled Cable Assembly, Keyboard	5	20
10281	Wiring Harness Assembly, Main	5	20
10146	2764 EPROM, IC U8	5	20
95855	8748 Microprocessor, Keyboard	5	20
95803	Character Generator EPROM, US	5	20

## SECTION 5

### **CIRCUITS AND DIAGRAMS**

The following circuits and diagrams are provided for reference:

- Functional Block Diagram,
- Interconnect Wiring Diagram,
- Keyboard Schematic,
- Video PCB Schematic,
- Logic PCB Schematic (5 Sheets).



231-8

Figure 5-1. QVT-102 Functional Block Diagram

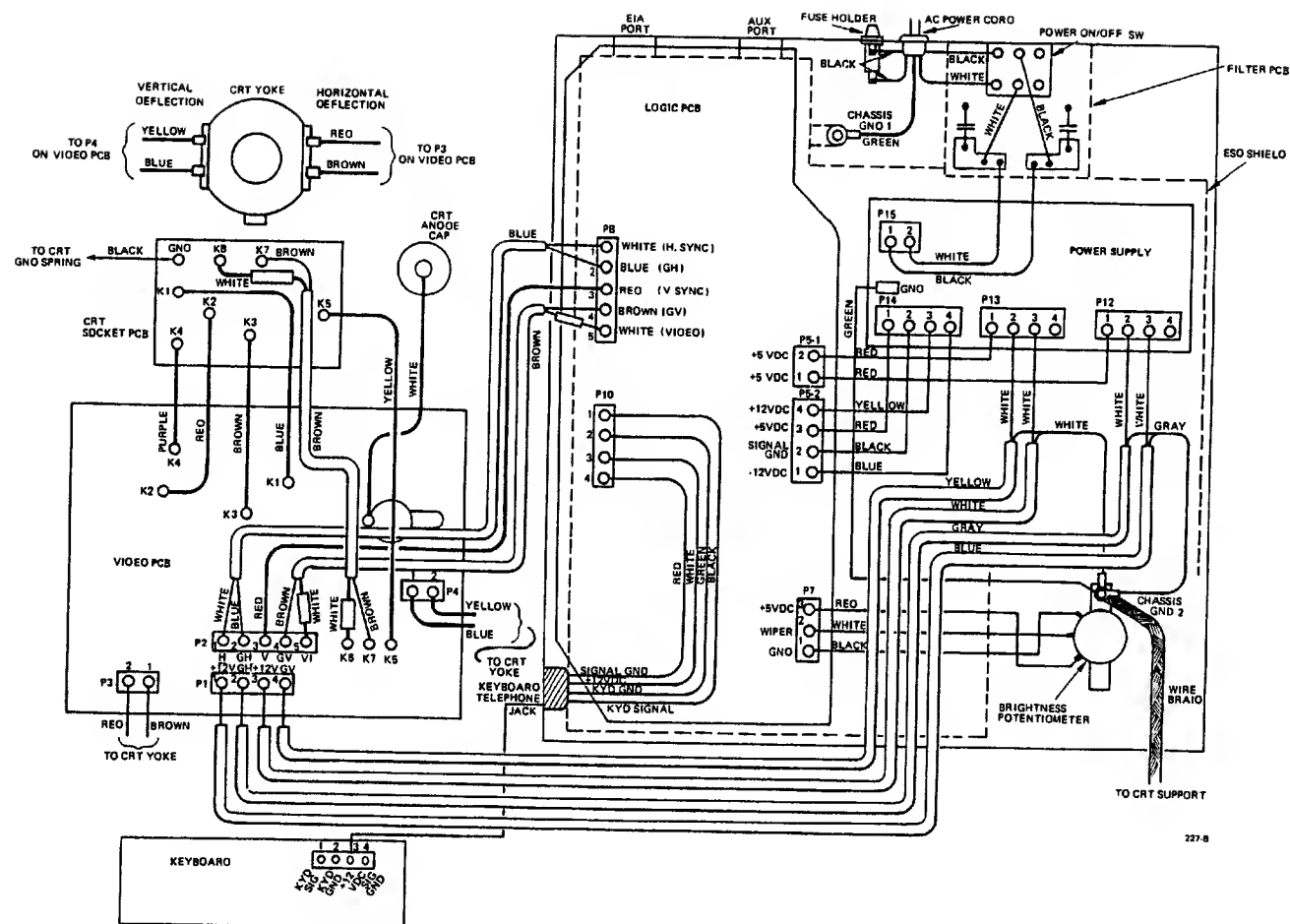
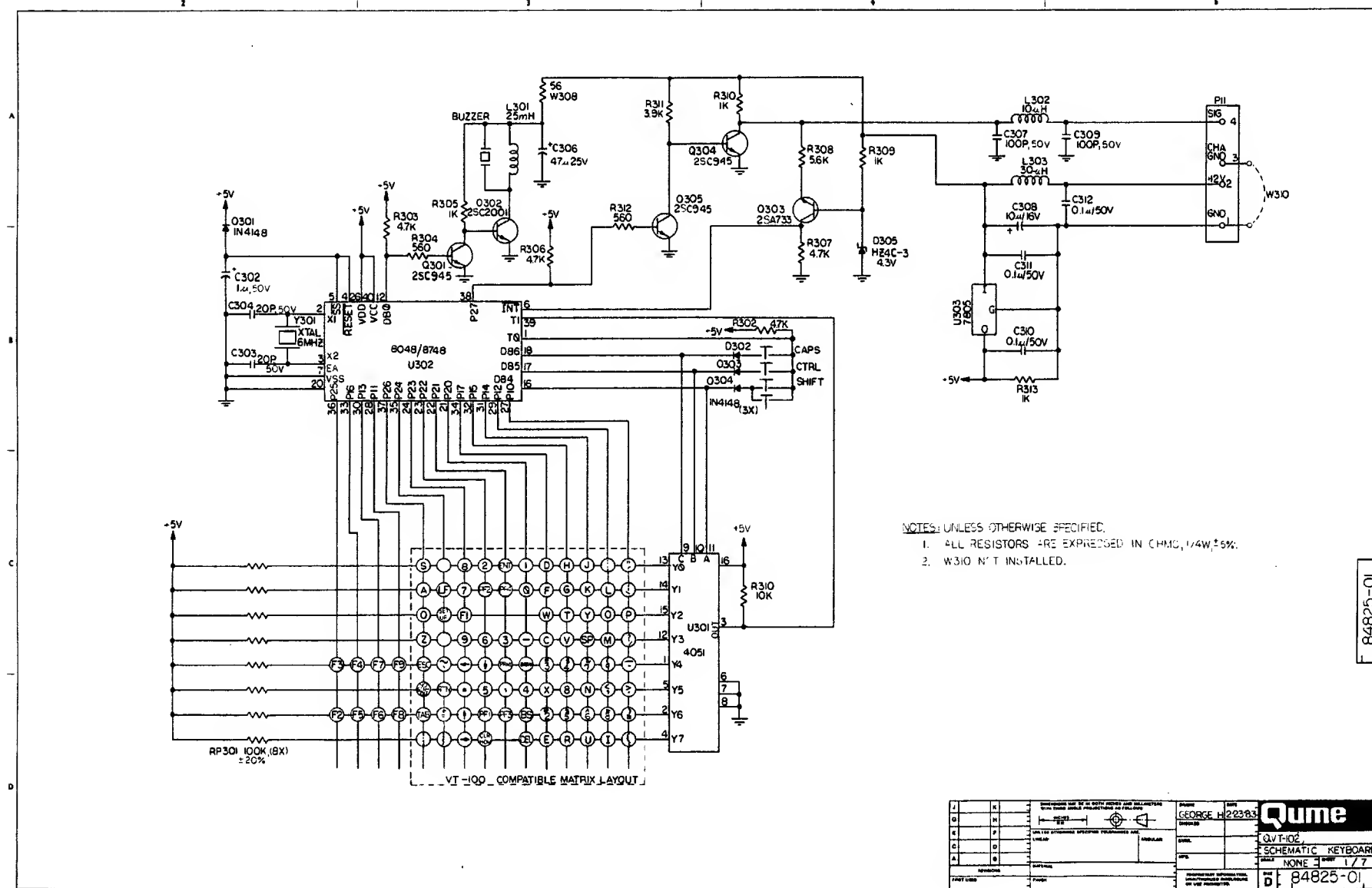
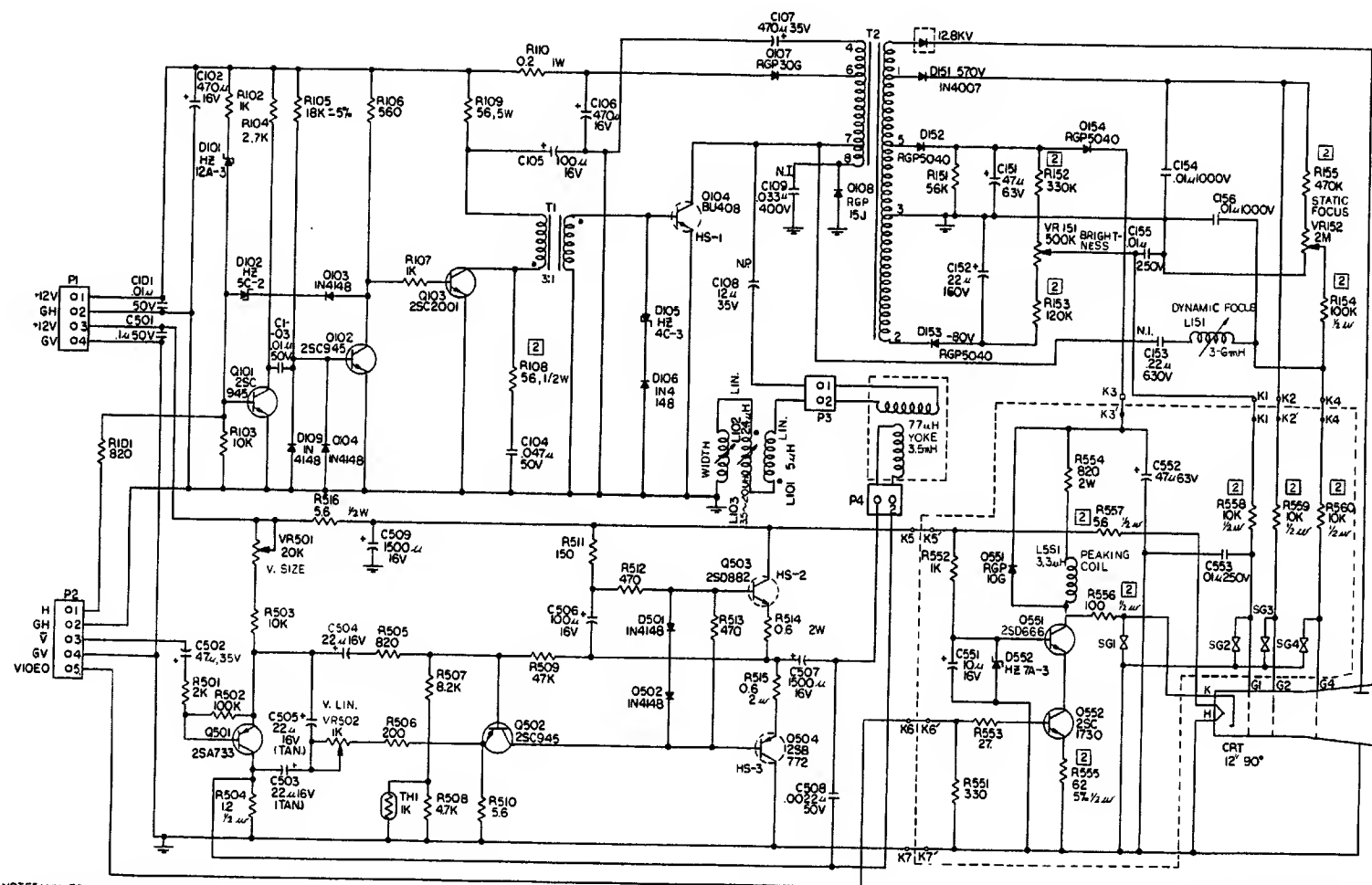


Figure 5-2. QVT-102 Interconnect Wiring Diagram



84825-01



NOTES: UNLESS OTHERWISE SPECIFIED  
 1. ALL RESISTORS ARE EXPRESSED IN OHMS, 1/4W, ±1%.  
 2. CARBON COMPOSITION RESISTOR.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56	Q57	Q58	Q59	Q60	Q61	Q62	Q63	Q64	Q65	Q66	Q67	Q68	Q69	Q70	Q71	Q72	Q73	Q74	Q75	Q76	Q77	Q78	Q79	Q80	Q81	Q82	Q83	Q84	Q85	Q86	Q87	Q88	Q89	Q90	Q91	Q92	Q93	Q94	Q95	Q96	Q97	Q98	Q99	Q100

Figure 5-4. QVT-102 Video PCB Schematic



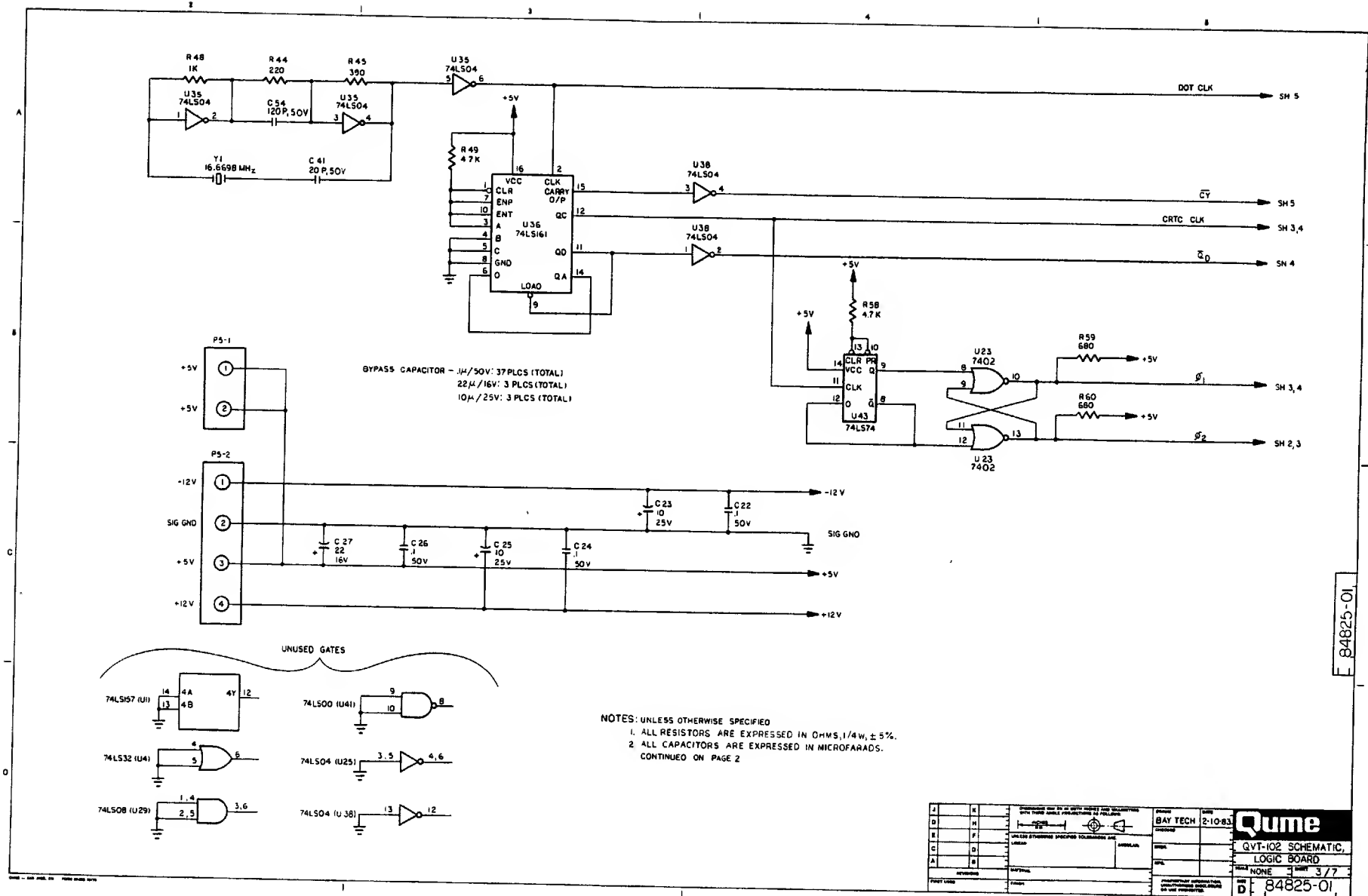


Figure 5-5. QVT-102 Logic PCB Schematic

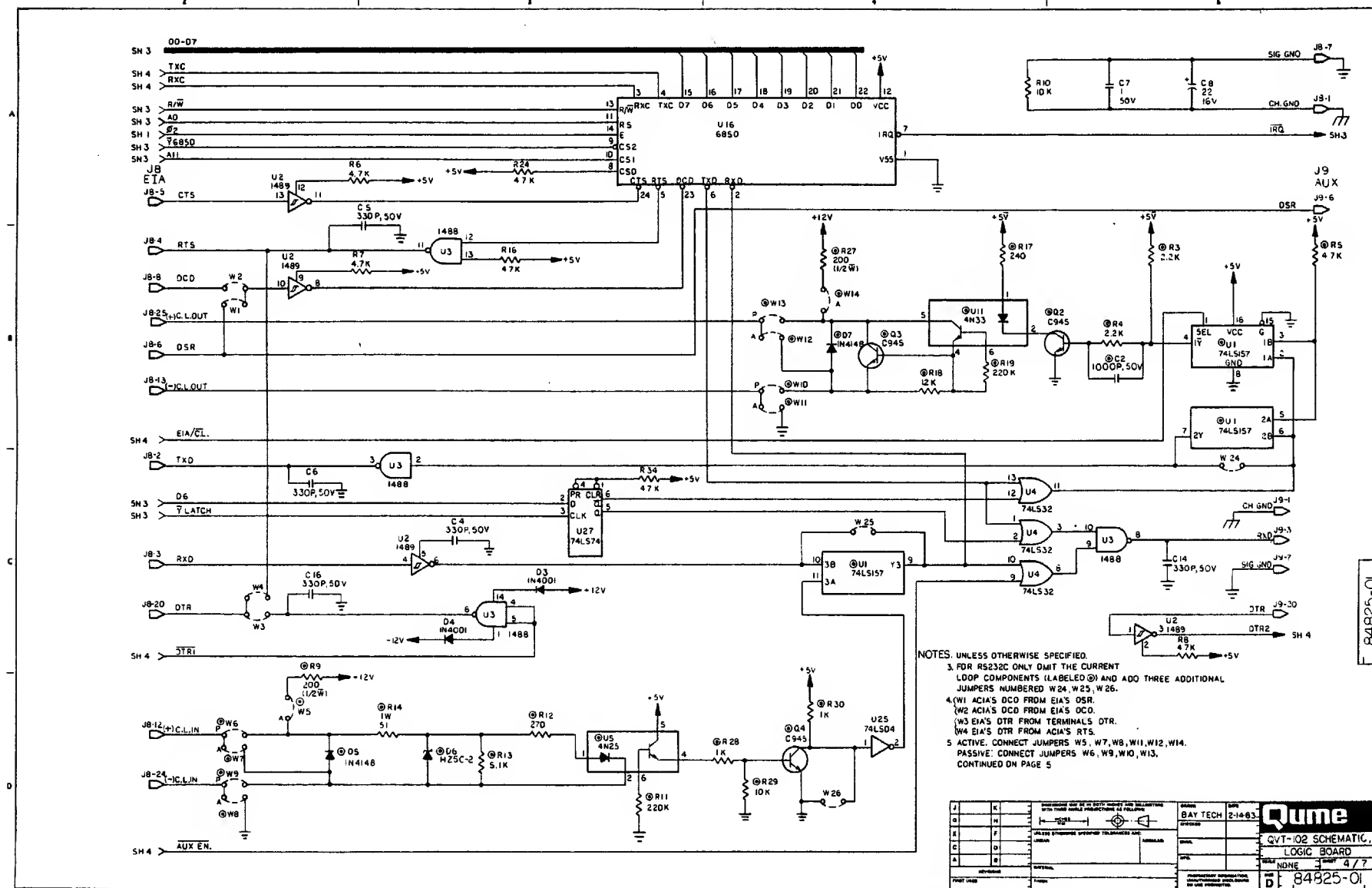
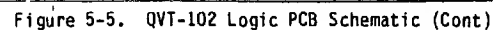


Figure 5-5. QVT-102 Logic PCB Schematic (Cont)



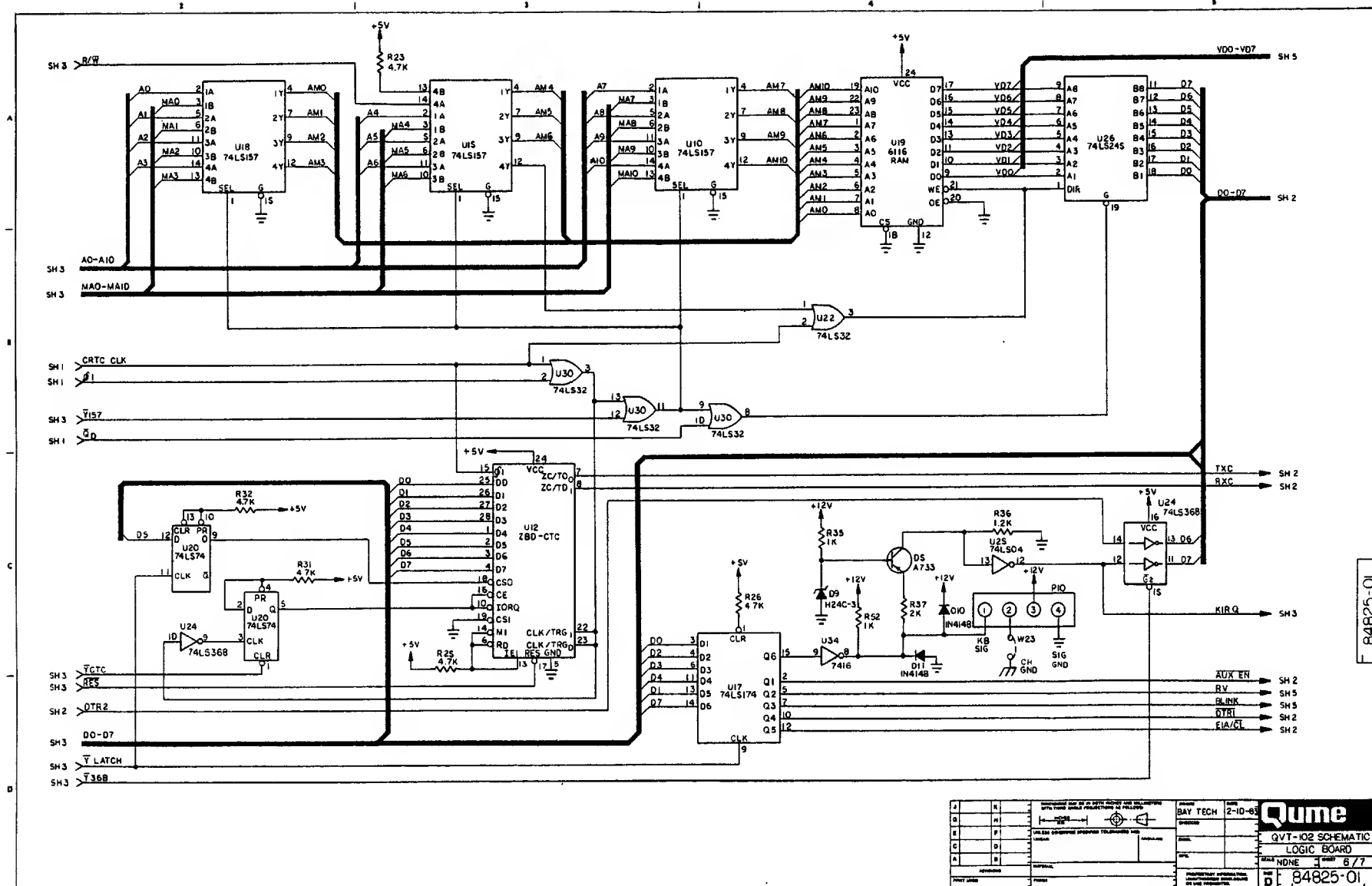


Figure 5-5. QVT-102 Logic PCB Schematic (Cont)

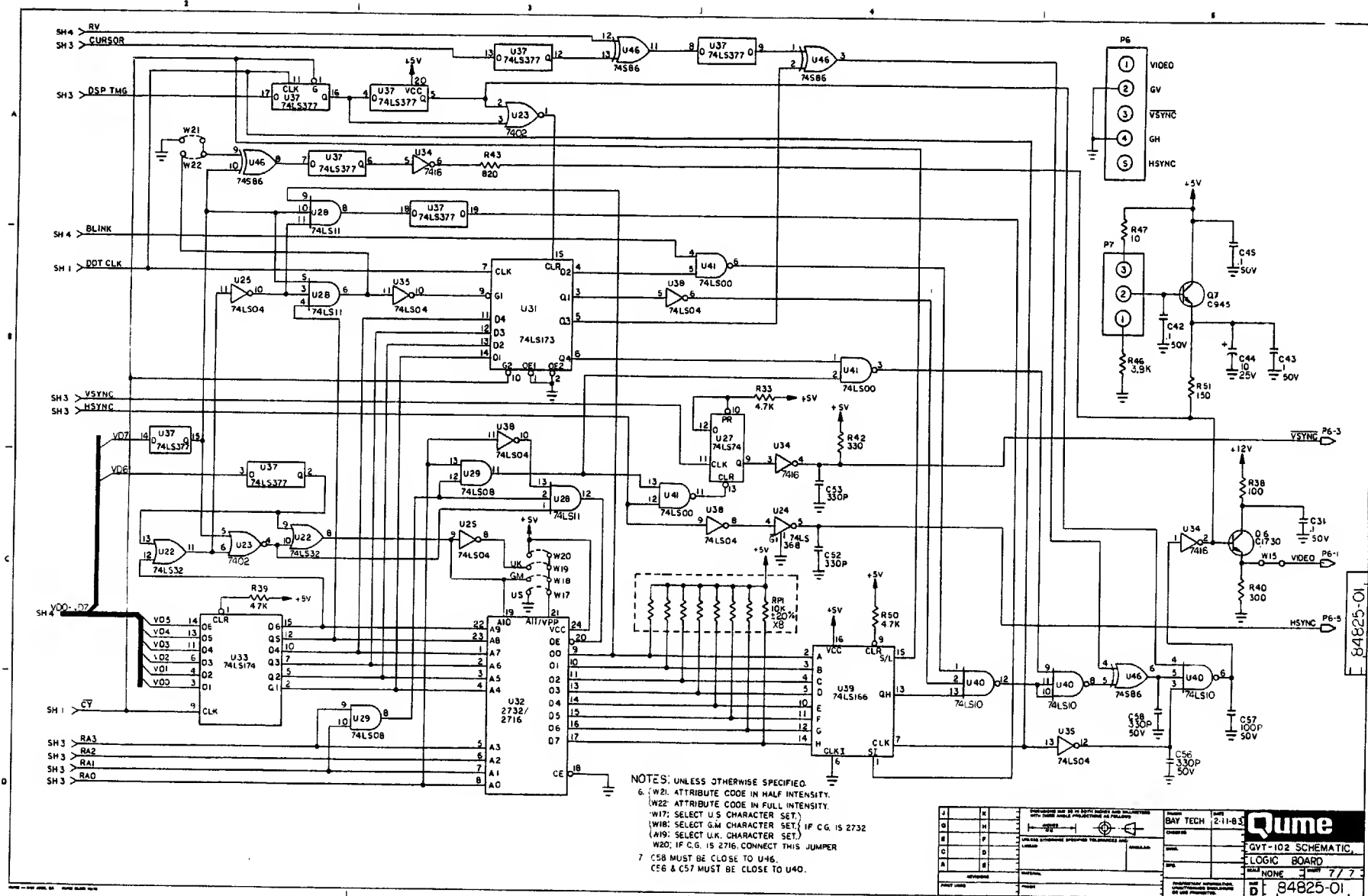


Figure 5-5. QVT-102 Logic PCB Schematic (Cont)

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